DOCUMENT RESUME

ED 042 596

SE 007 581

AUTHOR	Brainard, Robert W., Ed.
TITLE	Science Policy Bulletin, Volume 2 Number 3.
INSTITUTION	Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
PUB DATE	Jun 69
NOTE	73p.
EDRS PRICE	EDRS Price MF-$0.50 HC-$3.75
DESCRIPTORS	*Annotated Bibliographies, Federal Legislation, Financial Support, Foreign Policy, *Government Role, Natural Resources, *Policy Formation, *Scientific Research, Socioeconomic Influences, *Technology

ABSTRACT

This bimonthly bulletin reports annotations of current literature on science and public policy. Coverage includes both "policy for science" and "science for policy" in the areas of engineering, technical and narrowly specialized publications. Its purpose is to aid persons who study, formulate, or implement public policy related to science by alerting them to new additions to the science policy literature. Documents are listed under the headings of (1) General, (2) Science, Domestic Problems and National Goals, (3) Needs and Allocation of Resources for Science, (4) National R&D Programs, (5) Science, Education, and the University, (6) Science Management and Policy-Making Bodies, (7) Science, Foreign Affairs, and National Defense, and (8) Science Policy in Foreign Countries. The 123 documents are listed under one of these categories. Cross-indexing is not used. Major meetings and other events in the area are also reported. (RR)

OCT - 6 1969

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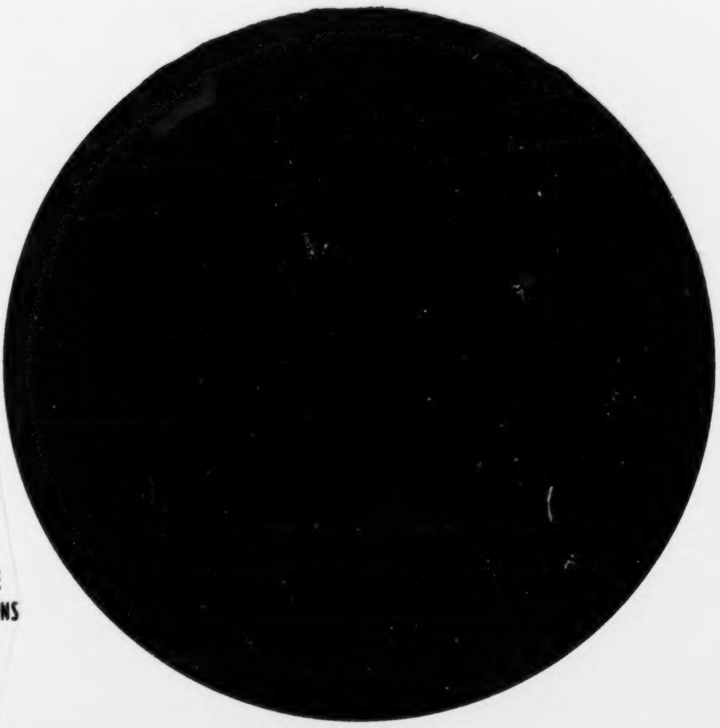
Vol. 2 Number 3
June, 1969



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Science Policy Bulletin

Battelle Memorial Institute

SCIENCE POLICY BULLETIN

The Bulletin, published bimonthly, reports the current literature in the area of science and public policy. The coverage encompasses both "policy for science" and "science for policy" matters. For brevity, "science" is used to denote engineering, technology, and science.

The Bulletin is intended for individuals engaged in studying, formulating, or implementing public policy relating to science and its use. The purpose of the Bulletin is to aid such individuals by alerting them to new additions to the science policy literature.

The information presented in the Bulletin consists principally of a bibliographic listing of current publications in the area. In addition, major meetings and other events in the subject area are reported.

The bibliography, although covering a broad topical scope, is selective in that publications of a highly technical and narrowly specialized nature are excluded.

The bibliographic information is presented under a number of topical categories. Each cited publication is recorded under a single category; cross indexing is not used. The numbering of publications under each category runs consecutively through all issues of the Bulletin, so that a given number refers to only one citation.

Copies of the listed publications are not available through Battelle but can normally be obtained from the originating agency.

The contribution of information to the Bulletin as well as suggestions and comments on its content, coverage, and format are solicited. All correspondence should be addressed to:

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BIBLIOGRAPHY

I GENERAL

27. "Proceedings of Trends in Science Policy", Battelle Seattle Research Center, Seattle, Washington, 27 March 1969, 133 pp.

The proceedings from a one-day program on "trends in science policy" are presented in this document. The program, which was sponsored by Battelle Memorial Institute, consisted of four formal presentations and a panel discussion. The first paper, presented by W.J. Harris,Jr., deals with the positions and views of the new administration with respect to science, congressional concerns, changes in the direction of the National Science Foundation, and some of the key policy issues confronting policy makers. The second paper, by L.L. Lederman, analyzes trends in R&D expenditures, relates these to national goals and priorities, and discusses their policy implications. The third paper, by D. Wolfle, examines trends in the production of university manpower with the conclusion that although "surpluses" are building up in some areas, national "needs and opportunities will continue to rise and will continue to require large numbers of talented, educated persons". In the fourth paper, B.C. Denny discusses government-university relationships, science and higher education, current threats to the university, and science priorities. The panel -- composed of E.B. Skolnikoff, R. Bowers, V. Rabinowitch, and N. Kaplan -- presented brief individual statements in response to the preceding papers; these are included in the proceedings, as well as summary comments on the entire program.

(The Proceedings of the program can be obtained by writing the Battelle Seattle Research Center, 4000 N.E. 41st Street, Seattle, Washington 98105).

28. "Centralization of Federal Science Activities", Report to the Subcommittee on Science, Research, and Development, Committee on Science and Astronautics, Prepared by the Science Policy Research Division, Legislative Reference Service, Library of Congress, U.S. House of Representatives, Ninety-first Congress, First Session, (29 May 1969), 1969, 108 pp.

Congressional hearings are planned to examine the used and desirability of centralizing Federal science activities. The present report (prepared by the Science Policy Research Division of the

Library of Congress) presents background material and a framework for these hearings. The core of the report is a pro-con analysis of the arguments for "a diffuse (the present) organization versus a centralized (the proposed) organization of Federal science activities"; to sharpen the discussion and structure the debate, a prototype centralized science agency, the "National Institutes of Research and Advanced Studies", is presented for comparison with the present system. The pro-con analysis is made with respect to the major functions of the Federal Government in dealing with science and technology, namely, policy planning, liaison with Congress, operational activities of funding and performing research, facilities planning and utilization, evaluating and using the results of R&D, and science education and manpower. Other sections of the report describe the present federal organization for science, summarize the evolution of this organization, and suggest questions and issues that should be resolved in the subsequent Congressional hearings.

(The report can be obtained from the U.S. Government Printing Office, Washington, D.C. 20402).

29. "Science Structure Criticized", Industrial Research, v. 11, no. 5, May 1969, p. 42.

"At least a minimal restructuring of the federal science establishment appears likely in the 91st Congress, but probably not during this year's session". "Daddario, along with most of his colleagues in Congress and virtually all the executive agency heads, is opposed to the perennial call for a 'science czar'. The reason is obvious: to remove the R&D function from existing agencies is equivalent to taking away their operational functions of the future -- as well as their best brain power. This leadership problem doesn't mean that a lot more consolidation can't -- or shouldn't -- occur". "Daddario lists five possibilities in descending order of difficulty: (1) A Dept. of Science, Education & Cultural Affairs combining NSF, NASA, AEC, National Institutes of Health, ESSA, National Bureau of Standards, Bureau of Higher Education (from HEW), and National Foundation for the Arts & Humanities. (2) A Dept. of Science & Higher Education containing essentially the same groups except those dealing with cultural development. (3) A loose confederation of agencies linked together by a supporting organization similar to the General Services Administration. (4) A statutory Council of Advisors on Science & Education responsible to both the President and Congress (in contrast to the present Office of Science & Technology, which is part of the White House staff). (5) Revamping OST to give it a mandate for setting science priorities and evaluating results". The remainder of the article discusses several inhibiting factors which will delay hearings until late in this session.

30. DuBridge, L.A., "Science Serves Society", Science, v. 164, no. 3884, 6 June 1969, pp. 1137-1140.

In this address to the National Academy of Sciences, DuBridge discusses the broad contributions that science makes to society, calls on the scientific community to help convince the public of the importance of basic research, and discusses several policy issues. He starts by noting the complexities of science and technology and the lack of the unanimity about "the relative importance of various fields of basic science", "the relative merits of basic and applied science", and priorities in the field of applied science". When the "complex scientific community" mixes with "the complex array of people and agencies in government", "the result is almost bound to be utter confusion". As for the relationship between science and society, "our humane goals have advanced faster than the ability of our science and technology ... to keep up". The importance of basic research is discussed and the need for justifying its continued growth to the public is emphasized. The problems of setting science priorities are reviewed with the conclusion that "broad and conclusive and universally agreed-upon priority conclusions remain as unreachable as ever". Relatedly, the issues involved in "the uses to which science should be put", and the impediments to its application to social-urban problems, are discussed. Finally, DuBridge suggests that science and technology "are no longer separable from political and social problems", and that they are "too important to stay out of politics".

31. "NAS President Discusses U.S. Science", Chemical & Engineering News, v. 47, no. 27, 31 June 1969, pp. 24-27.

This interview with Philip Handler, President of the National Academy of Sciences, touches on a number of the major problems now besetting American science. Some of the topics covered in the interview include: current issues and problems, chances for any relief from the financial crunch, the role the academy will play in the future, and the creation of a Department of Science. With respect to the problems, "we have a budgetary crunch, and we have an uncertainty with respect to [the relevancy] of science, a growing anti-intellectualism ... and competing needs for federal funds". Science's chances for any relief from the financial crunch are "virtually nonexistent"; even when the Vietnam question has been resolved "[s]upport of science will not automatically be turned on again". With respect to the role of the academy, it "must continue to serve its traditional purposes"; "it must utilize appropriate opportunities to state why they believe continued support of science truly is in the national interest"; "I have no reason to believe that the scientific understanding to be gathered tomorrow will be less applicable to human affairs than that which was gathered yesterday". Concerning a Department of Science to manage all federal R&D, "we're not going to revert to that plan". Handler discusses several alternatives for restructuring the federal science agencies, including a "Department of Science and Higher Education".

32. "Criteria for Federal Support of Science", A panel discussion arranged by the Division of Physical Sciences, National Research Council, National Academy of Sciences, (11 March 1969), Washington, D.C., 1969, 39 pp.

This report constitutes the substance of a panel meeting on the topic of the criteria for federal support of science. The proceedings of the meeting consist of six informal papers and a discussion section. The first paper, by Harvey Brooks, discussed the basis on which decisions concerning the level of support should be made for different types of research. Philip Abelson discussed the evolving political climate and some of its effects on the criteria for support of science and the special needs for new and costly instrumentation. Carl Kaysen focused on the question of overall allocation of resources to basic science and the division of that total among fields, with the conclusion that the criterion of allocation cannot be, as it often is, anyone "who comes to 'X' level of competence and who wants to be a scientist ought to be supported". Albert Clogston cites some of the problems in establishing "workable and persuasive criteria", and makes several suggestions for a "defensible system of determining proper levels of basic-research support". Roland Schmitt critized the criterion that "support should be sufficient to enable every individual, who is intellectually qualified to do so, to pursue scientific research"; the 'overhead' concept, he contends, is the route to take. Frederick Seitz discusses some of the factors that must be considered in the rationale of support for science, such as "the balance between large and small needs and the geographic-sectional interests of our population".

(This report may be obtained from the National Academy of Sciences, 2101 Constitution Ave., Washington, D.C. 20418).

33. Weinberg, A.M., "Scientific Choice and the Scientific Muckrakers: Review Article", Minerva, v. 7, nos. 1-2, Autumn-Winter 1968-69, pp. 52-67.

This article is both a review of Greenberg's book, The Politics of Pure Science, and a response to some of the issues and problems raised in it. "The politics Mr. Greenberg inveighs against ... are not unique to science, but are a necessary element to every bureaucratic enterprise which operates outside the market place". "Politics", says Weinberg, "are part of the process of establishing priorities, and politics are seldom polite -- even the politics of pure science". "The danger is that some structural deficiency in the bureaucracy, or some extraneous political element, may so distort the natural working of the political process as to lead to scientific foolishness". Weinberg discusses the approaches and problems to setting priorities within science, and argues that the continuing debate on criteria for the support of science is providing "an ethical and aesthetic framework which ought to make the politics of science more rational". The question of whether pure science "is a purpose of society" is examined; Weinberg presents reasons for viewing "basic research as a justified 'overhead' on the entire scientific-technological enterprise", and discusses the "constructive interaction" that exists between basic science and technology. Finally, "if one concedes that the politics of science exist -- and this cannot be denied -- then we shall have to live with some mechanisms for keeping the politics honest and truthful". Toward this end, Weinberg proposes that scientists themselves, as well as journalists such as Greenberg, should take the role of "scientific critics" and "examine the scientific-political scene with ... comprehensive understanding and detachment".

34. "Science and Social Controls", Bulletin of the Atomic Scientists, v. 25, no. 5, May 1969, p. 21.

The Bulletin devotes its "Comment" section to five articles, summarized below, that deal with the rising concern among university scientists over the "exploitation of science and technology for purely military use", the need and means for applying science to "the problems of mankind", the social control of science and its applications, and the role of the scientist in society.

(1) Schwartz, D., "Manipulators of Science -- Winners and Losers", (pp. 21-22,36)

The question of "whether science can be controlled, and who should control it" is discussed, with the conclusion that scientists, individually and collectively, can and must exercise such control. Schwartz notes three areas that must be so controlled: the development of "weapons of war", which is now dominated by "self-serving military and political leaders"; the "awful side-effects" of "rampant technological advance", which arise "through simple lack of awareness or concern"; and the massive problems of overpopulation and the cities. The necessary concern and control does not come from professional societies nor from the government's science advisors, because the first "shun" opinion and judgment and because the second, who are "merely merchants and not leaders", do not "represent their scientific colleagues" and fail to "speak out forcefully even on controversial matters". Swartz calls for a code of ethics for scientists, for an integration of "his roles as scientist and concerned citizen", and for an organized involvement in politics.

(2) Lord Blackett, "The Ever-Widening Gap", (pp. 23-25)

This condensed article deals with the widening economic gap between the developed and underdeveloped nations, and how science and technology can help to close it. Data are presented to show the magnitude and aspects of the gap for various countries, as well as the rate ("about 5 per cent a year") at which the gap is widening. Blackett discusses the impact of foreign aid (it "has worked, but it has been very unevenly divided"). To achieve a 3.5 percent growth rate, which is needed to close the gap, would require aid amounting to "1.6 per cent of the GNP of the rich countries"; unless something in the order of $20 billion a year is provided in aid, "the gap will not be appreciably closed". Science and technology -- not modern, but "intermediate technology" -- can plan a crucial role in closing the gap: what is needed is technology "concerned largely with humdrum matters, getting machinery, factories going" and factories started, but such things as "education by satellite" and "agro-industrial complexes" are just too costly for many countries.

(3) DuBridge, L.A., "The Social Control of Science", (pp. 26-28,35)

The meaning and purpose of "social control" is discussed, the types of control now available are cited and described, and the role of the university in military R&D is discussed. DuBridge contends that we "do not want and we do not have any social controls over pursuit of basic knowledge", but that social controls over applied science do exist and will always exist". He cites and discusses the influence and scope of the latter controls, which include those of the individual, university, market, and government. The problem is now "how to invent social controls: the mechanism is already present". The question is rather, what do we want these controls to achieve?" The "real issue" is how to prevent the use of scientific knowledge for the production of lethal military weapons or other devices purposely or inadvertently harmful to large numbers of human beings". As for the universities, DuBridge believes they should not engage in secret military research, but believes they should not refuse "research support from the Department of Defense"; further it is "quite appropriate" for professors "to advise the government on its problems of defense technology".

(4) Wald, G., "America's My Home. Not My Business, My Home", (pp. 29-31)

This article covers a wide diversity of topics, including the public control of technology, national priorities, population, Vietnam, and bureaucracies. All "science is good", but "every project, every enterprise in technology, has constantly to be judged in terms of the needs, and goals and aspirations of society". Decisions about technology must not "rest with any of those who have anything to do, in any way, with the production" of technology; instead, "they have to rest with those of us who have to live with the products". "New technology mustn't be accepted as an aspect of fate" -- the primary question "is whether we, society ... the people who have to live with it, want it, find use for it". The ultimate criteria for these and other decisions is whether the result will be a "better world for children".

(5) Salloch, R., "March 4, the Movement and MIT", (pp. 32-35)

This article chronicles the events and discussions that occurred during the "research strike" in March at MIT. The "primary objective of the 'strike' organizers was to inaugurate a movement". The aim of the participating student group was the "cessation of MIT's research support of government policies"; the faculty's concern was broader and including the reallocation of funds from the "swollen military sphere to the neglected areas of social consequence", the "validity of current defense policies", and the problems and issues arising from imminent breakthroughs in science and technology such as "genetic manipulation". The various papers and discussions on these topics are briefly summarized by Salloch, with the conclusion that "in the end, means and goals remained to be clarified by future discussion and action".

35. Dedijer, S., "Science Policy Gaps: Their Relations to the Technological Gaps", Research Policy Program, University of Lund, Lund, Sweden, 3 May 1968, 26 pp.

Science policy is discussed as a "new social invention" -- a communication system -- that contributes to the "innovation processes" of a country in the pursuit of "social development goals". Technological gaps between nations are attributed partially to the "gap in the development of R&D policies of the national and lower levels". The relationships among "technological gaps", "innovation chain", "technological change policy", and science policy are described and illustrated. Three stages in the evolution of a science policy are identified, including the development of a "social communication system of science policy", the components of which serve as criteria for gauging the degree to which a country has progressed toward a mature science policy. Evidence is presented to show that the U.S. "has pioneered both in innovating the largest number of components of the ... communication system and in relating them to the whole innovation system and the national decision system of the country". Further, the U.S. is "way ahead of every other country in the world" in progressing through the third evolutionary stage, which focuses on improving the quality of the communication system through various means (e.g., study of science policy by social and behavioral scientists and the training of specialized manpower).

(The report is available from the author at the address given above).

36. "Technological Innovation and the Growth of the National Economy", The Science of Science Foundation Newsletter (SSF), v. 4, no. 3, April 1969, pp. 5-14.

A Science of Science Foundation International Symposium on the above subject was held in Cambridge, England on 11 - 13 April 1969. This article presents the program and abstracts of papers given at the symposium; the titles and authors of the papers are presented below.

Session I: Setting the Scene

U.S.A. - J.E. Goldman
Italy - A. Peccei
Japan - K. Oshima
Federal Republic of Germany - W. Muttelsee
United Kingdom - M. Shanks
Canada - A. Wilson
Netherlands - A. Pannenborg
OECD - K. Pavitt

Session II: Political, Social and Economic Aspects

The Role of Government - J. Duckworth
The Role of the Educational System - H. Wolff
The Investment Decision - D. Burn
Technological Innovation and Added-Value - L. Archer
Support of Technology - B. Flowers
Market Analysis and Marketing - A. Gellman

Session III: Industrial Aspects

A Management View of Innovation - A. Knoppers
A Trade Unionist's View of Innovation - Delacourt-Smith
A Strategy for a Post-Industrial Society - S. Bodington
Coupling Systems in Industrial R&D - C. Freeman

Session IV: International Aspects

International Interchange of Innovative Initiative - A. Mencher
Patents and Economic Growth - K. Johnson
Intervention - Bessborough

Session V: The Next Steps

The Right Climate for Innovation - G. Fryers

(For further information, write to: The Editor, SSF Newsletter, Science of Science Foundation, c/o Ciba Foundation, 41 Portland Place, London W1).

37. Price, W.J. and L.W. Bass, "Scientific Research and the Innovative Process, Science, v. 164, no. 3881, 16 May 1969, pp. 802-806.

Does scientific research play a central role in the innovative process, and if so, how? The authors attempt to answer this question by discussing the following topics: the nature of the role of science in innovation; the orderly and less predictable aspects of innovation; the results of several recent studies of the innovative process and the relevance of four types of "coupling (collaboration between the generators and users of information). Although the innovation process is "often viewed as an orderly ["linear"] process, starting with the discovery of new knowledge, moving through various stages of development and eventually emerging in final, viable form", recent studies have indicated that "the 'linear model' is not typical". After a review of several studies, three key characteristics in the innovation process are pointed out: (1) new knowledge is essential although its discovery is not the typical starting point; (2) key information often comes from "unrelated research" since the requirements of innovation more often cannot be anticipated in definite terms and ... cannot be programmed in advance"; (3) the true function of basic research is, in fact, the "meaningful dialogue between the scientific and technological communities". In addition, a model of the innovative process and its managerial aspects are examined, and four main types of the "coupling" between scientists and technologists are described. It is concluded that basic science is an essential part of the innovative process, but that additional studies of the "coupling" process are needed.

38. Gordon, T.J. and A.L. Shef, "National Programs and the Progress of Technological Societies", The Journal of the Astronautical Sciences, v. 15, no. 5, September - October 1968, pp. 231-241.

"The relationship between national programs and the progress of technological societies is established through a description and definition of the nature of technology. What forms its bounds, sets its limits, promotes its dissemination, and determines its significance is discussed. On the basis of these concepts, the technological development of various selected countries and societies throughout the 20th century is measured approximately; from the indicated results, conclusions are drawn regarding factors which influence technological growth. Against these growth models, sociological measures in the form of social and economic indexes are compared, setting forth certain beneficial attributes (and, to a limited extent, the negative attributes) of modern industrial societies. Finally, having defined technology, traced its growth in several societies and its implicit social effects, the paper discusses the kinds of programs which promote its generation". Among the major conclusions from the study are the following: "Technology grows at an exponential rate, doubling about every 20 years"; "National programs ... do not affect the rate of technology generation; rather they affect its content"; "Social benefits increase proportionately with technological advances", but social "ills also mount"; and although alternative programs "can be compared on the basis of their potential for generating and spreading technology", "these comparisons often lead to little insight as to the 'better program".

39. Smith, T.M., "Government Development of Aerospace Science and Technology: Cost to Society", AD 684 194, Oklahoma University, Norman, Oklahoma, (1968), March 1969, 9 pp.

"The social cost of modern science, R&D, and technology is a function of year-to-year improvisation brought on in part by government practices and in part by vague understanding of the nature and limitations of science and technology. Mistaken identification of technology with science and of both with the R&D processes produces confused application of the standards of one to measure performance of either of the other two. The result is a widening of the gaps between practice and policy and between the esthetics of understanding and the ethics of using, thereby exacerbating our mismanagement of science and of our limited national resources". Topics covered in this report include: "Science and Technology", "The Scientific Revolution", "Early R&D", "Science or R&D", "What Experiments Can't Do", "The Impracticality of Science", and "The Practicality of R&D".

(This document may be obtained from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia, 22151, Price: $3.00).

40. Dator, J.A., "Political Futuristics Bibliography", World Future Society, December 1968, 23 pp.

This bibliography, compiled by J.A. Dator, is an informal document reproduced by the World Future Society. The bibliography includes a listing of "journals of interest to Futurists" as well as specific books and articles. The journal listing is divided into three categories: "Primarily futuristic, or frequently having futuristic articles", "having occasional futuristic articles" and "seldom having futuristic articles, but helpful for background or methodology". Books and articles are cited under nine categorical headings: (1) General Futuristics, (2) Political Futuristics, Science, Technology, and Government, (3) Social and Economic Effects of Technology, (4) Computers, Simulation, Cybernetics, Artificial Intelligence, Information Retrieval, (5) Biomedical Advances; Ecological and Environmental Influences on Man; New Ethics, (6) Space, Transportation, Weather, The Sea, (7) General Theories of Social Change, Development and Modernization, (8) Theory and Methodology of the Social Sciences, (9) Methodologies of Forecasting.

(Information concerning this bibliography can be obtained from the World Future Society, P.O. Box 19285, Twentieth St. Station, Washington, D.C. 20036).

II SCIENCE, DOMESTIC PROBLEMS, AND NATIONAL GOALS

25. "Systems Technology Applied to Social and Community Problems", Prepared for the Subcommittee on Employment, Manpower, and Poverty, Committee on Labor and Public Welfare, U.S. Senate, Ninety-first Congress, First Session, (June 1969), 1969, 473 pp.

This study, prepared by the Science Policy Research Division of the Library of Congress, surveys and assesses the role of system analysis in dealing with community and social problems, in such areas as transportation and water resource planning, health services, education, environmental pollution, and urban housing problems. "The objective of the report is to explore the present and potential application of systems technology to nondefense, nonspace public problems; describe selected programs and projects which have been undertaken at the Federal, regional, State, or local level; and review those legislative proposals concerned with the creation of a mechanism to apply innovative tools and techniques to the full range of social and community problems". Conclusions derived from this information include the following: "social and community problems must be monitored by some responsible public institution"; information regarding the state of the art of system analysis and its applications should be widely disseminated; an evaluative capability at the Federal level for cost-benefit comparisons of proposed technological change is required; Congress should consider authorizing and directing Federal agencies to develop system analysis capabilities appropriate for use at the State and local level, and possibly require its use in federally funded programs; Congress should consider tax incentives for private groups who develop systems methodologies for the needs of State and local governments.

(The report is available from the U.S. Government Printing Office, Washington, D.C. 20502).

26. Cohn, S.I., Law Enforcement Science and Technology II, Port City Press, Inc., 1969, 612 pp.

This volume is a compilation of papers presented during the Second National Symposium on Law Enforcement Science and Technology in April 1968, which was conducted by the IIT Research Institute. Ten broad problem areas were covered: Riot Prevention, Riot Prevention and Control, Communications, Corrections, Criminology, Criminalistics, Fingerprints, Information Storage and Retrieval, Police Management and Operations, and Alarms and Surveillance. In each of these areas, several pertinent topics are discussed which illustrate the dimensions and scope of the specific problems. Some new approaches to these problems are suggested (e.g., systems analysis of a police communication center), possible applications of new technologies are presented (e.g., application of mobile telecommunications to law enforcement operations), and summaries of the state of the art in several areas (administration of criminal justice, command and control system, etc.) are presented. The potential contributions of science and technology, and specifically the potential contributions of the social sciences, are discussed in detail.

27. "New Subcommittee for Social Problems", Science News, v. 95, no. 26, 28 June 1969, p. 615.

"A new Senate Special Subcommittee on Social Program Planning and Evaluation to deal with the nation's social problems will be headed by Sen. Walter F. Mondale (D-Minn.). Hearings are scheduled to begin mid-summer on the general need in the society for better social planning and evaluation. The subcommittee hopes to take an active role in filling the gap in information on manpower programs and equal opportunity programs. Sen. Mondale's bill to set up a Council of Social Advisers similar to the Council of Economic Advisers will also receive consideration. The subcommittee, says Sen. Mondale, will 'provide a public forum for continuing critical study of the Government's attempts to meet the nation's social goals'".

28. "Scientific and Technical Communication: A Pressing National Problem and Recommendations for Its Solution", A Report by the Committee on Scientific and Technical Communication of the National Academy of Sciences - National Academy of Engineering, NAS Publication No. 1707, 1969. Unabridged Edition (336 pp.), Synopsis (30 pp.).

This report is a 3-year survey (1966-1968) of the present status and future requirements of the scientific and engineering community "with respect to the structuring, flow, and transfer of scientific and technical information". The report surveys and appraises federal and private information activities and considers "the most effective intellectual, economic, and technological means of increasing the efficiency of information transfer and use". Recommendations of the report are grouped into five general areas: (1) "Planning, Coordination, and Leadership at the National Level"; (2) "Consolidation and Reprocessing - Services for the User"; (3) "The Classical Services" (abstracting, indexing, etc); (4) "Personal Informal Communication"; (5) "Studies, Research, and Experiments". A major recommendation made by the Committee is the establishment of a Joint Commission on Scientific and Technical Communication, responsible to the National Academy of Sciences and the National Academy of Engineering.

(The report can be obtained from the National Academy of Sciences, Printing and Publishing Office, 2101 Constitution Ave., Washington, D.C. 20418, Price: $6.95).

29. Ottinger, R.L., "The Congress and Environmental Deterioration: Immovable Object/Irresistible Force?", BioScience, v. 19, no. 6, June 1969, p. 554.

Congressman Ottinger describes the objectives, activities, and scope of the Ad Hoc Committee on the Environment. Formed in June 1968, its function is "to open ... communication between Congress and the scientific, business, and conservation communities on matters relating to the environment". The Committee, which now has a Congressional membership of 112 and over 100 advisors, "is entirely informal and unofficial, which permits it to operate outside of traditional procedures of seniority and control". The staff work for the Committee is handled by a nonprofit organization, the Environmental Clearinghouse, Inc. Areas of concern for the Committee are power generation, pesticides, noise, the urban environment, population, endangered species, and costs and benefits. Future topics of interest are expected to include air and water pollution, solid waste disposal, weather modification, scenic pollution, and transportation.

30. Lamson, R.W., "Policy Considerations for Environmental Management", Paper presented at the Symposium on System Analysis for Social Problems, National Bureau of Standards, Gaithersburg, Md., 28 May 1969, 22 pp.

A general analysis is presented of the myriad policy issues involved in environmental management, an approach to defining the goals and alternatives for management is outlined, and the actions and institutions needed are suggested. After discussing "the environmental problem and the idea of environmental management as a solution to it", the author cites the questions "which underlie any environmental policy decision" and presents guidelines for management. Goals are suggested for the uses of technology and resources, as well as for waste management. Institutions, techniques, and policies required to achieve these goals are discussed and several needed actions and institutions are identified, including an annual report on the state of the environment.

31. "Select Committee to Study Environment", Industrial Research, v. 11, no. 5, May 1969, pp. 42-43.

Senator Edmund S. Muskie has proposed that the Senate create a select committee to study the effect of technology on the human environment. Muskie's select committee would "set up a formal mechanism for making committees aware of what others are doing with respect to the human environment"; it would have no jurisdiction over legislation. The committee would consist of three members each from seven committees concerned with environmental questions: Agriculture & Forestry, Banking & Currency, Commerce, Interior & Insular Affairs, Labor and Public Welfare, Public Works, and Government Operations. The Aeronautical & Space Sciences Committee and the Armed Services Committee were omitted from the committee because "Muskie wants to step on as few toes as possible"; his resolution failed in the past two Congresses.

32. Barker, A., "Policies for the Environment: Too Many Cooks?", BioScience, v. 19, no. 5, May 1969, pp. 457-458.

"There was a time ... when those advocating a national policy for the restoration and preservation of the environment were a small and lonely group. But this is no longer true, and we may be in danger of devoting so much time to discussing a variety of proposals ... that nothing will actually get DONE". The plethora of legislative proposals now pending before Conress are briefly described. In addition to these, President Nixon is "reported to be preparing an executive order which would establish an interdepartmental committee on the environment under the direction of his science advisor, Dr. Lee DuBridge. This is quite different from the councils being proposed in several of the [Congressional] bills. Congress has in mind an independent group with power and prestige similar to that of the Council of Economic Advisors".

33. "Administration Eliminates State Technical Services Funds", Washington Science Trends, v. 22, no. 4, 5 May 1969, p. 19.

"The Nixon Administration has ... eliminated all proposed state funding for the State Technical Services [STS] Program, which was supposed to have been the major means of bringing the Nation's advanced technology to local enterprises. The action came in the amended budget presented by the Administration, which proposes to eliminate all grants for Fiscal 1970, leaving only a token $290,000 to keep the Washington staff operating". Funding for the program dropped from $6.5 million in Fiscal 1968 to $5.3 million in 1969. "The [STS] program has been controversial from the start, and is in competition with similar efforts funded by ... NASA and the AEC". "The Administration pointed out that the STS program has about $1.9 million in unobligated funds for the current fiscal year, plus an additional $6.7 million in 'unliquidated obligations' in the states for this and prior years and that this represents a 'substantial fiscal momentum' for the fiscal year which begins July 1. However, officials in the program say that almost all of this money represents previously approved programs for which states have yet to send in reimbursement vouchers. They said the availability of funds was a question of 'semantics' and that organizations taking part in the program will be unable to plan new or continuing programs without some confidence that funds will be available".

34. Sovel, M.T., "Technology Transfer - A Selected Bibliography", NASA CR-1355, Prepared by the University of Denver, Denver, Colo. for the National Aeronautics and Space Administration, Washington, D.C., June 1969, 101 pp.

> "This bibliography is the initial attempt at compiling a comprehensive listing on the subject of technology transfer". "Technology is considered here to be technical information, including scientific knowledge, making possible the conception, development, design, production, and distribution of goods and services. Transfer here means the effective communication of such information from one person or source to a recipient who accepts it for consideration and possible application. The bibliography is further concerned with information which leads to a greater understanding of the factors affecting the transfer process, namely, the barriers and incentives to the process". "The bibliography [which contains 428 entries] is arranged in three sections: an alphabetical listing, an author index, and a KWIC (key word in context) index".
>
> (The report can be obtained from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151, Price: $3.00).

III NEEDS AND ALLOCATION OF RESOURCES FOR SCIENCE

17. "U.S. R&D Will Nearly Double by 1978", Scientific Research, v. 4, no. 11, 26 May 1969, p. 13.

"By 1978, the U.S. will be doing almost $46 billion worth of r&d, or almost double what was done in 1968. This prediction was made this month by the economics department of the McGraw-Hill Publishing Co. in its first attempt at a long-range forecast for r&d". "By 1978, the r&d forecast predicts U.S. industry will be performing $33.6 billion worth of r&d (compared with $17.6 billion last year); colleges and universities will be doing $5.6 billion worth ($3.2 billion last year); government labs will be doing $5 billion worth ($3.5 billion last year); and non-profit labs will be doing $1.6 billion ($840 million last year). Not all of these increases will be real, however, because of rising costs. The real gain in industry between 1969 and 1972, for example, is put at only 5.3 percent a year, as against an apparent rate of 7 percent". Additional forecasts of the survey include: (1) "industry will be spending more on basic and applied research and less on development as percentages of the total U.S. investment in r&d"; (2) "industry will spend about $866 million on laboratories and lab equipment this year"; industrial employment of scientists and engineers is expected to average 4 percent (the present annual rate is 3.2 percent), reaching a total of 387,000 by the year 1972.

18. "R&D Activities of Local Governments, Fiscal Years 1966 and 1967", NSF 69-14, Surveys of Science Resources Series, National Science Foundation, March 1969, 60 pp.

"This report is the first to provide information on local government involvement in research and development". It provides "data on local government units, and also summarizes such data by States so that they can be compared with State government R&D levels, and Federal geographic R&D distribution patterns". The information contained in this report includes the following: Local and Government Expenditures for Research, Development, and R&D Plant; Types of Governmental Units; Source of Funds; Geographic Distribution; Functional Areas; Fields of Science; Performers; Character of Work; R&D Personnel; Ratio of R&D Expenditures to Total Expenditures; and, Comparison of Local, State, and Federal R&D Activities. "The statistical limitations of this report are covered in the 'Technical Notes' as are the criteria used in the selection of the survey sample".

(This document can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price: $.65).

19. Harris, F.R., "The Need for a National Social Science Foundation", Trans-action, v. 6, no. 7, May 1969, pp. 3,6,63.

Some of the provisions of the proposed National Social Science Foundation Act, and the need for such a "new instrument", are discussed by Senator Harris. "The bill declares as national policy that the encouragement and support of ... the social sciences is a matter of great concern to the federal government"; the proposed Foundation "would do no in-house research but would ... underwrite, fund, and support academic research, education and training" in the social sciences. Several "key issues" identified in Congressional hearings "would begin to be resolved by the creation" of the Foundation: the social sciences need for federal support; NSF "has given very little or no support at all to certain methodologies and disciplines within the social sciences"; the latter "have suffered from insufficient attention to their development, visibility, and prestige"; interdisciplinary research "must be conducted on a much greater scale"; and the "nation cannot adequately confront its myriad social problems without more social science knowledge". The recent act directing NSF to provide greater support to the social sciences is not expected to meet these needs, contends Harris.

20. "NSF May Take a $50-Million Budget Cut", Scientific Research, v. 4, no. 11, 26 May 1969, pp. 11-12.

The National Science Foundation (NSF) is requesting a $500 million budget as it did last year. However, instead of a $100 million budget cut as last year, it is believed the cut "may come to as much as $50 million -- certainly no more, possibly a little less". The size of the cut may depend on several variables: (1) the amount finally appropriated by Congress may be subject to an expenditure ceiling imposed on the executive branch by Congress. (2) The $17 billion federal R&D budget will have to be balanced with "public demands for economy". "New factors in congressional budget action this year are the recommendations of the House and Senate subcommittees handling the authorizations for the NSF's budget. This is a new step in the appropriations process; the subcommittees authorize expenditures but the Appropriations Committees actually provide the money". Although the budget cuts of last year caused an uproar, in general, "the attitudes toward the NSF and science ... are strictly neutral" from the subcommittees. The remainder of the article presents several optomistic opinions of ranking subcommittee members and NSF officials toward the new appropriations.

21. Boffey, P.M., "House Panel Kind to NSF Budget but Trims Some Programs", Science, v. 164, no. 3880, 9 May 1969, p. 656.

> "The National Science Foundation has emerged relatively unharmed from the first authorization hearings ever held on the agency's annual budget": the House Subcommittee on Science, Research, and Development cut NSF's 1970 budget by less than 2 percent of the amount requested, some $9 million. The largest cut, $4 million, was imposed on a new program to support "interdisciplinary academic groups in the performance of research, both basic and applied, on problems relevant to society". The subcommittee "imposed two other major cuts ... by requiring that two 'big science'constructions be deferred": "the subcommittee declined to authorize $3.3 million to resurface the radiotelescope at Arecibo, Puerto Rico", as well as "$2 million to build a new oceanographic research vessel".

22. Boffey, P.M., "House Group Recommends Big NSF Cut", Science, v. 164, no. 3887, 27 June 1969, p. 1506.

> The House Appropriations Committee has "chopped $80 million from the National Science Foundation's budget request for the coming fiscal year", reducing the proposed $500 million budget to $420 million. The full House must vote on the committee's recommendation, which also must be reconciled with approiations action that the Senate may take. Explaining the cuts, the committee said: "The funding level of Foundation programs has more than tripled in the last decade, and the Committee feels the funds in the bill will provide a reasonable level of funding for 1970". The author adds that the "bill contains the same antiriot provision that is contained in the current NSF appropriation act. The provision requires universities to deny NSF aid to anyone who, on the basis of a hearing, is found guilty of a willful and serious refusal to obey orders".

23. "NSF Spending Ceiling", Science, v. 164, no. 3880, 9 May 1969, p. 652.

> "The National Science Foundation announced ... that it will impose expenditure ceilings on some 150 institutions during fiscal year 1970. The institutions that will be affected are those whose expenditures from NSF funds are expected to exceed $500,000 during the year. Specific ceilings will be transmitted to those institutions by mid-June". "[T]he new plan affects only about 150 institutions, whereas the old plan imposed ceilings on some 500 institutions whose annual NSF expenditures exceeded $50,000 apiece". "[K]nowledgeable officials don't expect that the percentage reduction required under the new plan will be quite as high as that required under the old. The new plan specifically exempts various summer programs, traineeships, and individual fellowships and travel awards from the expenditure ceilings". "The new

ceilings are merely intended to keep spending within the limits specified for NSF in the Johnson and Nixon budgets. If Congress imposes a further mandatory spending reduction, as seems likely, NSF may have to revise its plans and tighten up even more".

24. "DOD Sees Upswing in Research Funds", Scientific Research, v. 4, no. 11, 12 May 1969, pp. 13,15.

If Congress approves the Department of Defense's (DOD) 1970 budget for R&D, a reversed trend in the two most basic categories of research will occur. The two categories, which are part of the Research, Development, Test and Evaluation (RDT&E) are research and exploratory development. "Because of budget squeezes in the last few years and the annual 4 percent to 5 percent increase in the cost of living, the Pentagon is funding only about 60 percent of what it funded" in these categories in 1964. "The Defense Dept. hopes the downward trend has been stopped". Funds for research in the 1969 budget total $406 million; the exploratory development funding is $875 million. For the 1970 budget, now before Congress, a request has been made for $432 million for research and $970 million for exploratory development. These requests were not touched by President Nixon in last month's budget cutting. Overall, the Defense Dept. is asking for $8.2 billion in RDT&D research funds for next year, compared with the $7.6 billion it has this year". The remainder of the article briefly discusses the political and technical issues related to the thinning amount of DOD money that is available for research.

25. Boffey, P.M., "Defense Research: Pressure on Social Sciences", Science, v. 164, no. 3883, 30 May 1969, pp. 1037-1039.

A sharp curtailment of support for overseas social science research by the Department of Defense (DOD) is discussed. Research in the area of "understanding foreign nations and policy planning studies aimed at developing strategies for dealing with political and military developments around the world" have provoked much controversy, especially in Congress. Accordingly, DOD has: (1) reduced expenditures for such research by more than two-thirds; (2) adopted new guidelines for restricting the kinds of projects it will support; (3) tried to persuade the State Department to assume greater responsibility for such research by offering State $400,000 to start such a program; and (4) proposed the "establishment of an interagency committee to determine what foreign area research should be performed and which government agency should support it". Under the new guidelines, DOD will sponsor social science fieldwork in other countries only when at least one of the following criteria is met: "(i) it is related to specific operational needs in countries where we have substantial forces at the time of the study; (ii) it is requested by U.S. military officials in the country and concurred in by the host government; (iii) it involves contact only with U.S. personnel and not with foreign nations; (iv) it is requested by the government of the country in which it is to be carried out; (v) it is personally approved by the Secretary of Defense because of its 'extreme interest'". Implications of these policy changes are discussed.

26. "Defense Dept. to Boost Space, Aeronautical Research Funding", Aviation Week & Space Technology, v. 90, no. 19, 12 May 1969, p. 27.

"Funding for Defense Dept.'s space and aeronautical research and development programs will increase by a net of more than $515 million in Fiscal 1970 over Fiscal 1969". A net increase of more than $128 million in space programs and a net rise of $387 million in aeronautical research and development has been reported. "In the space area the major increase is for satellite communications. The budget will more than double, from $70.8 million in Fiscal 1969 to $149 million. Funding for advanced aeronautical research and engineering will increase by $404 million, from $382 million in Fiscal 1969 to $786 million in Fiscal 1970". "In addition to communications, this is the Fiscal 1970 funding for space programs: manned space flight, $528 million; navigation, $25 million; space-borne detection, $158 million; space defense, $11 million; vehicle and engineering development, $61.1 million; space ground support, $263 million; basic and applied research and component development, $147 million, and general support, $868 million". The remainder of the article discusses some of the highlights of John S. Foster, director of defense research and engineering, testimony at the Senate space committee.

27. "Budget Cuts Hurt Many - But Not as Badly as Feared", Physics Today, v. 22, no. 6, p. 67.

"The financial outlook for university physics remains grim, according to a survey just completed by the Committee on Physics and Society of the American Institute of Physics". Financial cuts have had these effects: (1) 102 physicists have lost all research support; (2) 1361 professional staff members' research projects have been adversely affected; (3) the growth rate of physicists on university faculties has decreased; (4) fewer postdoctoral fellowships were awarded during 1968-69 than in previous years; (5) the total number of graduate students declined; and (6) 34 percent of the department chairmen responding to the survey said "they had to alter plans for new buildings or equipment". "Although some chairmen offered gloomy comments, the consensus appears to be that things are not as bad as some had feared a year ago".

28. "Budget Pinch Hits Radio Astronomy", Scientific Research, v. 4, no. 11, 26 May 1969, p. 15.

> "Even though the Smithsonian Institution is putting its weight on Capitol Hill behind the proposed construction of a large, $25-million radio-radar telescope, prospects look bleak for government funds for any new radio telescopes in the next few years. The budget restraints on U.S. radio astronomy come at a time when several other countries are building large, sophisticated telescopes". "Three Smithsonian regents ... have introduced a bill requesting $2 million for planning and land acquisition. No hearings have been scheduled, however". Several other radio astronomy projects proposed by NSF are listed and described. The main concern is that in "comparison with other countries, the U.S. is behind in both the size of its existing radio telescopes and in the construction of new ones".

29. "NAS Expenditures Climb to $26.7 Million; Support in Current Year Expected to Level Off", News Report, National Academy of Sciences, National Research Council, National Academy of Engineering, v. 19, no. 5, May 1969, p. 7.

> "Expenditures by the National Academy of Sciences for current operations rose 19 percent in fiscal 1968 to a record $26.7 million". However, it appears that support from the National Science Foundation in fiscal 1969 will be reduced by between 15 and 20 percent. In addition, it appears that "new undertakings with funds from sources other than NSF would be about equal to reduction of support from that agency". "Of the Academy's eight major functional expense categories, the largest during 1968, $6.3 million, was research activities". "The second largest category, $5.1 million, was for the fellowship and exchange programs the Academy administers". Other expenses are cited. Of the $29.2 million from grants, contracts, and contributions, $25.4 million was for specific advisory studies and other services. "Of this, Federal government contracts accounted for $22.9 million, or 90 percent. The remainder was from private sources".

IV NATIONAL R&D PROGRAMS

29. "An Oceanic Quest", An Appraisal by Committees of the National Academy of Sciences and the National Academy of Engineering, Washington, D.C., 1969, 115 pp.

    This joint report by the National Academy of Sciences (NAS) and the National Academy of Engineering (NAE) provides advice on the scientific and engineering aspects of U.S. participation in the International Decade of Ocean Exploration. The Academies examined "the scientific and engineering goals and priorities among these goals, the capabilities required to achieve them, the program elements of a Decade of Ocean Exploration, and the end products and benefits to be anticipated if the Decade were to be implemented". The program areas discussed center on four major topics: geology and nonliving resources, biology and living resources, physics and environmental forecasting, and geochemistry and environmental change; both scientific and engineering aspects are considered under each of these topics. The final section of the report discusses "the capabilities required for achieving Decade goals"; financial, organizational, political, and technical considerations are reviewed, and "attention is drawn to their implications for successful prosecution of the Decade".

    (The report is available from the Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Ave., Washington, D.C. 20418).

30. Murphy, T.P., "Mobilization for the National Program in Marine Sciences: Organizational Considerations", Public Administration Review, v. 29, no. 3, May/June 1969, pp. 263-275.

    This report is a review of the efforts of the Executive and Legislative Branches to coordinate the national marine science program. It covers the creation and operations of both the National Council on Marine Resources and Engineering Development and the Commission on Marine Science, Engineering, and Resources. An analysis is made of the organizational alternatives that have been proposed for marine sciences including a "wet-NASA"; reorganization using ESSA as the pivot; a COMSAT-type organization and establishment of a National Oceanographic Council. Several forms of organization are feasible, all of which would represent an advance over the current situation which fragments the effort among 11 departments. The Commission has just recently issued its report, Our Nation and the Sea, which discusses in great detail a proposed recommendation for reorganization.

31. "Establishment of Committee for Policy Review", News Release, National Council on Marine Resources and Engineering Development, Executive Office of the President, Washington, D.C., 24 June 1969, 1 p.

> "The National Council on Marine Resources and Engineering Development announced the establishment by Vice President Spiro T. Agnew of a standing Committee for Policy Review. The Committee will assume the duties previously carried out by the Committee on Marine Research, Education and Facilities, the Committee on Ocean Exploration and Environmental Services, the Committee on Multiple Use of the Coastal Zone, and the Committee on Food-from-the-Sea". "The Committee is charged with considering issues within the mandate of Public Law 89-454. These issues will be referred to it by the Council Chairman or generated by the Committee itself. Ordinarily, international issues will continue to be considered by the Committee on International Policy in the Marine Environment. The Committee for Policy Review will evaluate the importance of issues, establish ad hoc task groups as necessary to develop facts, analyses, and interagency views, and review papers to come before the Council prior to their submission to the Council. The Committee will also designate appropriate mechanisms to insure effective interagency communication and coordination".

32. "No Ocean/Atmosphere Agency This Year", Scientific Research, v. 4, no. 12, 9 June 1969, p. 21.

> "It looks as though the proposal for a national oceanic & atmospheric agency, launched just before the Nixon Administration took over from the Johnson Administration, will never be commissioned. In January, the Johnsonians came out with a comprehensive report urging creation of such an agency through amalgamation of the Environmental Science Services Administration (ESSA), the Coast Guard, and appropriate bits and pieces of other agencies. Donald Hornig, Johnson's science adviser, had even hoped that the agency would be the model for creation of a federal science agency. The new Administration, however, has undertaken a study of the entire federal structure, so all reorganization proposals have been frozen. In addition, the Departments of Commerce (ESSA's parent agency) and Transportation (the Coast Guard's parent agency) strongly oppose creation of the national oceanic & atmospheric agency -- so it's likely that Congress will extend the life of the National Council on Marine Resources & Engineering Development for another year, until June 30, 1970. That council is the nearest thing now to a federal agency on oceanography".

33. "MOL Canceled in Abrupt Decision", Aviation Week & Space Technology, v. 90, no. 24, 16 June 1969, pp. 28-29.

> The manned orbiting laboratory (MOL) program was abruptly canceled, primarily on the basis of budget considerations. The

Air Force and its associate contractors will be forced to relocate personnel; however, according to Deputy Secretary of Defense David Packard, "'we are ... exploring with NASA the usefulness of some MOL developments to NASA programs'". The total program cost has doubled the original 1965 estimate of $1.5 billion; furthermore there have been advances in automated techniques for unmanned systems. Schedule slips, funding cuts, and technical problems would have "delayed the first manned flight to mid-1972 and run the total program cost to about $3 billion"; the delay would also have caused some state-of-the-art obsolescence. The cancellation is expected to save $1.5 billion from Fiscal Year 1979 to 1974.

34. Normyle W.J., "Post-Apollo Task Forces Formed", Aviation Week & Space Technology, v. 90, no. 12, 12 May 1969, pp. 22-23.

The National Aeronautics and Space Administration is currently evaluating post-Apollo manned space flight options, and has recently issued requests for proposals from the aerospace industry for such programs. NASA recently established "two task groups within the manned space flight area -- one to deal with proposed earth-orbiting space stations; the other to evaluate the space shuttle systems that would provide logistics for the stations". The space shuttle task force will be headed by George E. Mueller under the direction of LeRoy E. Day. Charles W. Mathews, assisted by Astronaut Frank Borman, will head the space station task force. The projected space station will provide "broad support for various activities, such as oceanography, meteorology and physics", among other activities. Studies of low-cost shuttle systems are currently being conducted for NASA by General Dynamics, Lockheed, McDonnell Douglas and North American Rockwell.

35. "Civil Aviation Research and Development: An Assessment of Federal Government Involvement", Aeronautics and Space Engineering Board, National Academy of Engineering, Washington, D.C., August 1968, 76 pp.

This report summarizes the results of [illegible] first study conducted by the recently established Aeronautics [illegible] Space Engineering Board (ASEB) of the National Academy [illegible] Engineering. "The Board has concluded that in a favorable economic climate civil aviation can continue to flourish ... if a carefully conceived program of planning and research and development aimed specifically at the civil air transport system is carried out. After considering the multiplicity of factors affecting the growth of civil aviation, the Board concluded that the three most critical factors are (1) airport and support facilities, (2) noise, and (3) air traffic control". "The most important recommendation of the Board pertains to knitting together more tightly the civil aviation research and development activities of the Department of Transportation, its major operating unit, the Federal Aviation Administration, and the National Aeronautics and Space Administration, and especially to dividing their responsibilities according to capability". This is discussed in further detail. "The Board has also made many detailed technical recommendations concerning research and development needs". "Although many technical recommendations are made, no priority ordering is attempted beyond the conclusion" that the three most critical areas are as mentioned above.

(The report is available from the Aeronautics and Space Engineering Board, National Academy of Engineering, 2101 Constitution Ave., N.W., Washington, D.C. 20418).

36. "National Atmospheric Sciences Program, Fiscal Year 1970", ICAS Rpt. No. 13, Interdepartmental Committee for Atmospheric Sciences, Federal Council for Science and Technology, Executive Office of the President, Washington, D.C., January 1969, 64 pp.

This report is the latest in a series of annual reports prepared by the Interdepartmental Committee for Atmospheric Sciences, a committee of the Federal Council for Science and Technology. The report outlines research and development activities which are expected to cost $202 million. The planned Program is summarized in three tables, which list (1) the total support of research in the atmospheric sciences by agency, (2) the total support of the Federal program in the various research categories, and (3) the total support of each agency in each of the research categories. The summaries are followed by descriptions of each agency's program. A modest increase in funding is proposed (1) for several agencies in an effort to broaden the knowledge of the physical and dynamic processes governing the behavior of the atmosphere, and (2) for support of U.S. participation in the Global Atmospheric Research Program as an element of the World Weather Program.

(Copies of the report are available from Captain Sherman W. Betts, Executive Secretary, Interdepartmental Committee for Atmospheric Sciences, Department of Commerce, Washington, D.C. 20230).

37. Friedman, S., "IBP and the Legislature", BioScience, v. 19, no. 5, May 1969, pp. 459-460.

A new congressional resolution designed to "provide impetus to the International Biological Program" has been introduced into the House. The resolution is "a very real, planned and coordinated effort to establish an ecological base for the management of our environment and for the prevention of the deterioration which is threatening our entire planet". "The resolution, if passed, will specifically authorize all Federal agencies having functions or objectives related to the IBP to obligate or transfer money from appropriate funds to that effort. It is designed, according to Mr. Daddario, to 'provide the kind of funding authority which is essential to a successful United States effort within the IBP'". "Agreements on points of responsibility have been worked out with the National Science Foundation as the lead agency. The program's grasslands ecosystems project, even on a minimum budget, appears to have become a model project in systems ecology". The remainder of the article discusses individual Congressional opinions and questions of funding. Although it has "pointed out that $15 million would be closer to the needs of the various IBP research programs for FY 70", "they would be happy with $7-8 million or even just the full $5 million line item".

38. "Sale of Atomic Fuel Plants Considered", Science, v. 164, no. 3881, 16 May 1969, p. 812.

"The Atomic Energy Commission (AEC) may move to transfer the nation's atomic fuel processing plants to private industry. On AEC initiative, a small White House study group, which includes the President's Science Advisor Lee. A. DuBridge, plans to look into the matter". "The move to sell the plants, which are estimated to cost the government about $2.4 billion, is certain to meet with opposition in Congress, particularly from the Democrats. Representative Chet Holifield (D-Calif.) the influential chairman of the joint committee, and Senator Clinton P. Anderson (D-N.M.) have indicated that they may oppose the sale on the grounds that such a transfer would result in sharp increases for electrical energy users and a boost in government costs of developing atomic weapons".

V SCIENCE, EDUCATION, AND THE UNIVERSITY

32. "Education and Federal Laboratory-University Relationships", Proceedings of a Symposium, (29-31 October 1968), Federal Council for Science and Technology and American Council on Education, May 1969, 251 pp.

This symposium was convened to discuss the motivations, mechanisms, problems, and prospects for university-federal laboratory collaboration in education and research. Areas of discussion centered around (1) the use of federal facilities for training university graduate students in various scientific and engineering fields, (2) formal education and training programs for laboratory professional staff, (3) joint research activities involving university and federal personnel, and (4) interchange of professional personnel between universities and federal laboratories. Several examples of existing collaborative arrangements are described in some detail. A few general steps to be taken beyond the symposium were suggested by Allen V. Astin, Chairman of the Committee on Federal Laboratories: these included an analysis of the symposium itself to determine the different types of successful interchanges and obstacles to be overcome; identification of policy changes needed for effective collaboration; and the support of new legislation related to collaborative efforts.

(The report can be obtained from the U.S. Government Printing Office, Washington, D.C. 20402, Price: $2.00).

33. "NASA's Sustaining University Grants Salvaged", Science, v. 164, no. 3879, 2 May 1969, p. 533.

"The Sustaining University Grants Program of the National Aeronautics and Space Administration (NASA) will be continued next year at its present $9-million funding level. In an earlier action, a Science and Astronautics subcommittee ... reduced NASA's sustaining university grants program for fiscal 1969 by $6 million. The subcommittee had recommended that all of the $3 million be earmarked for research and that no new funds be provided for training, partially on the grounds that too much emphasis was being placed on administration and management training, and not enough on predoctoral training in the space sciences. After reviewing the Nixon budget revisions, which left the sustaining university grants program untouched, the subcommittee held additional hearings, restored the funds to this year's level, and recommended that $4 million be designated for training programs". "During the past 4 years NASA's sustaining university grants program declined from $45 million in fiscal 1966 to $9 million in fiscal 1969".

34. "Campus Unrest Stymies Themis", Industrial Research, v. 11, no. 6, June 1969, pp. 34-35.

> "Project Themis, the Pentagon's program to distribute research dollars to universities that wouldn't normally get them, is caught in a crossfire between dissident students and a Congress that is becoming increasingly hostile toward student disorders. Some of the students don't want the grants because they are tied to military programs. Congress wants to put more restrictions on the grants, such as last year's Higher Education Act amendment barring funds to students convicted in disorders. Countering the students' objections, the Pentagon's Directorate of Defense Research and Engineering protests that the grants are all for unclassified, rather basic research. It notes that no security clearances are necessary unless the investigators want access to classified documents to determine the context of their work". The remainder of the article discusses the aims of Project Themis. The program started at $20-million in FY 1967 and has been running around $28-million a year since, including the FY 1970 request".

35. "More Contract Terminations for Themis", Scientific Research, v. 4, no. 11, 26 May 1969, p. 17.

> "The Defense Dept.'s Project Themis will get its second round of "dropouts" next month -- involuntary dropouts, that is. A handful of the first universities that got Themis projects, in fiscal-year 1967, will be notified that no new funds will be provided for their contracts after June 30. Themis contracts are step-funded -- receiving full funding while the project is desirable to the Pentagon, then partial funding over a 2-year period after a decision to terminate. The schools to be dropped simply haven't come up with the performances the Pentagon had hoped for, explained an official of defense research & engineering, which is responsible for Themis. But that was to be expected, he added, since so many of the contractors had had little or no experience working with the various armed services. How many universities will be affected? Fewer than 10, predicts Arwin A. Dougal, chairman of the Themis task group at the Pentagon. On the other hand, up to 25 new contractors will be added during fiscal '70, which begins July 1".

36. A Trend Against Institutional Grants?", Scientific Research, v. 4, no. 13, 23 June 1969, p. 15.

> "Interest in institutional grants for universities is dwindling, according to some Nixon Administration officials, in favor of the concept of giving some federal aid directly to students. This alleged shift (some university representatives and Capitol Hill staffers deny there is a shift) follows the simultaneous appearance last fall of the Carnegie and Rivlin reports, which agreed against institutional grants and advocated giving students increased 'purchasing power' through tuition grants. The two

reports rejected the Miller bill, which would create an institutional-grant program of about $400 million a year. It is likely, according to Administration sources, that tuition grants will become a keystone in future federal policy toward the universities. Some change in policy has already begun with President Nixon's directive to the Department of Health, Education & Welfare to convert some of its facilities grants into loans and to put the brakes on grants for buildings and equipment. Fellowship grants might also be converted into loans, according to the Administration officials. Supporters of the House's Miller bill and its Senate counterpart, the Harris bill, however, believe that interest in institutional grants has never been stronger".

37. Walsh, J., "Confrontation at Stanford: Exit Classified Research", Science, v. 164, no. 3879, 2 May 1969, pp. 534-537.

The opposition to military research at Stanford University by student activists and its immediate consequences are reviewed. The "precipitating issue was military research performed on the university campus and at the nearby Stanford Research Institute". "What sets the Stanford incident apart ... was the 9-day occupation of the Applied Electronics Laboratory on campus and the interruption of classified working being done for the government". "The immediate sequels" to these actions "were the decisions ... to phase out most of the classified work on campus and a faculty move to overhaul guidelines and review machinery in a way that would bar almost all military research from the Stanford campus". The background to the protests is reviewed, the issues involved are examined, and the impact on the faculty and the university is discussed. Suggestions for changing university rules regarding classified research offered by Wolfgang Panofsky are presented. The author concludes that the important issues "at Stanford are unresolved, and the results of the ... confrontation must be viewed as inconclusive".

38. Walsh, J., "Stanford Research Institute: Campus Turmoil Spurs Transition, Science, v. 164, no. 3882, 23 May 1969, pp. 933-936.

"A decision by Stanford University trustees to cut the university's ties with the Stanford Research Institute (SRI)" is being protested by student activists, who want the Institute integrated with and controlled by the University. In severing its ties with SRI, the University trustees "set no deadline for disengagement ... nor did they specify the future form of SRI organization"; however, they did endorse a ban on the development of chemical and biological warfare weapons. Militants now insist that SRI "be converted to more 'socially constructive' work" and that this requires SRI to be controlled by the University. Against this background, the origin, activities, and policies of SRI are reviewed, as well as the reactions of SRI management and staff to the pending separation. Consensus seems to favor separation; "a majority of the institute staff would walk out if outside control was imposed on SRI research". As for the separation, many of the SRI staff "feel that not much will change because SRI has not really had a symbiotic relationship with Stanford". However, the "militant assault" has forced SRI "to examine its policies and future prospects more carefully, perhaps, than ever before".

39. Mueller, M., "M.I.T. Reviews Its Military Research Policies", Science, v. 164, no. 3880, 9 May 1969, p. 653.

An investigation panel has been formed to review the relationships between M.I.T. and two of its laboratories (Lincoln and the Instrumentation laboratories) which conduct classified research. "In the meantime, M.I.T. has declared a moratorium on all new classified research programs at the two laboratories". "Sources at M.I.T. say that the move to examine its policy on conducting classified and other military research was sparked in part by the March 4th research stoppage ... and by recent queries by a radical student group, the Science Action Coordinating Committee, concerning M.I.T.'s ties to the Pentagon". The investigative panel will "examine the relationship of the laboratories and their current and future research programs to M.I.T.'s on-campus research and education programs in general". The principal types of research done by the two labs are indicated, their sources of funding, and their relationships with the University are described.

40. "MIT Urged to Continue Defense Labs", Scientific Research, v. 4, no. 12, 9 June 1969, p. 14.

A report recently issued by MIT's investigation panel on military research has urged that the nature of research carried on at MIT's off-campus labs, Lincoln Laboratory and the Instrumentation Laboratory, be shifted from classified research to more socially oriented research. The 22-member committee, composed of faculty, students, administrative staff, alumni, and trustees, made these recommendations: (1) "MIT retain the two off-campus labs ... and try, over a period of time, to convert a major part of their work from defense research to civilian research"; (2) a "temporary ban on accepting new classified research be lifted at once"; (3) a "standing committee on special laboratories be set up to review research programs that exceed an agreed-on size"; (4) "intensive efforts be made to reduce the security restrictions surrounding Defense Department-supported work". Currently, the Instrumentation Lab's budget for 1969 is $54.6 million and about 25 percent of the work is classified; Lincoln Laboratory's budget is $65 million -- all from the Defense Department -- and about 40 percent of its work is classified. Reactions to the committee's recommendations are presented.

41. Coburn, J., "University Contractors Cut Ties with CRESS, HumRRO, Army's Two Main Centers of Social, Behavioral Research", Science, v. 164, no. 3883, 30 May 1969, pp. 1039-1041.

> Two universities announced "that they will divest themselves of their Army-sponsored research offices". The "American University said it will spin off its Center for Research in Social Systems (CRESS), an organization which, under a different name, conducted the ill-fated Project Camelot that provoked an international controversy in 1965"; and "George Washington University said it will sever relations with its Human Resources Research Office (HumRRO), an organization that conducts work of various kinds in the behavioral sciences". These two research groups are "the Army's largest contractors in social and behavioral science research". The circumstances leading up to the severence, the options open for CRESS and HumRRO, and the financial loss to the universities are discussed. "The decisions to spin off CRESS and HumRRO were largely the result of recent student protests against military research". With respect to the options opened to CRESS and HumRRO, CRESS is considering "becoming a non-profit group, or merging with another such group". No specific option was discussed for HumRRO; however, researchers at "both CRESS and HumRRO express confidence that the productivity of their organizations will not be adversely affected by leaving the university". As to the financial loss, both universities will be affected: "American University had been receiving overhead costs of roughly $400,000 a year to operate CRESS, and George Washington was receiving a fixed fee of about $240,000 a year to run HumRRO".

42. "DOD Plays Down Effect of Campus Protests", Chemical & Engineering News, v. 47, no. 21, 19 May 1969, pp. 22-23.

> "Defense officials are playing down the effects of campus protests on the sharp drop in classified military research projects at universities". DOD contends that the drop can be attributed more to "administrative action" (declassification of once-classified projects) by DOD rather than to "pressures of campus dissidents". "Actually, the volume of military work on campus is about the same as it was two years ago". "To be sure, dissident faculty members and students have forced a number of schools [e.g., Stanford and M.I.T.] to take a new look at the schools' role in national security and at the question of whether they are neglecting other more socially directed research". "Still, Pentagon officials insist, campus demonstrations have had only a 'slight' impact on military research on campuses". "As a matter of fact ... more schools apply for secret projects than we have money for". Of the $250 million now going to universities from DOD, only $20 million is for secret projects; however, "it finances $100 million a year of work -- mostly secret -- at a number of 'research centers' such as MIT's Lincoln Laboratory".

43. "The Draft: Strong Words from NAS", Chemical & Engineering News, v. 47, no. 20, 12 May 1969, p. 18.

The National Academy of Sciences (NAS) at its recent annual meeting unanimously supported a "strongly worded resolution on the draft", which requests the NAS president to "bring the crisis created in higher education by current draft policy to the attention of the White House and Congress". Caltech chemist John Roberts reported to the convention that as a result of Selective Service laws which ended most student deferments for graduate study, "U.S. male graduate enrollments in the fall of 1968 dropped by as much as 50% from that of the previous academic year in some schools" offering chemistry Ph.D.'s. Similar findings from a new study by the Engineering Manpower Committee and a January report by the Scientific Manpower Commission were also cited: the former report estimated that "the draft may take within a year about 51% of first-year ... students enrolled last fall in engineering graduate programs". Overall, the impact of the draft has been less serious than expected; some of the factors behind this are briefly discussed.

44. "Foreign Students Fill Gap", Science News, v. 95, no. 19, 10 May 1969, p. 453.

"Bleak forecasts from the Scientific Manpower Commission that the draft would reduce engineering graduate school enrollment have not come true. But the gap caused by the draft was filled largely by foreign students, reports the Engineering Manpower Commission of the Engineers Joint Council. The findings result from a survey of the draft status of more than 12,000 engineering graduate students in 55 major universities. Higher than expected enrollment is due to the large numbers of foreign students, who constitute as much as 36 percent of the first-year full-time enrollment for advanced engineering degrees". "Still a matter of concern is the draft vulnerability among teaching and research assistants, most of them part-time students. There is a smaller concentration of foreign students in this group. Total graduate school enrollments have not decreased sharply, but the survey discloses that the planners in industry, education and government may have to revise their estimates when the male U.S. citizens of draft age are singled out".

45. "Long Takes New Post at Cornell", Scientific Research, v. 4, no. 13, 23 June 1969, p. 15.

"Franklin Long -- who almost became director of the National Science Foundation -- will resign ... from his post as vice president for research and advanced studies at Cornell to direct the university's ... new program on science, technology and society. The interdisciplinary program, which will include courses, seminars, and lectures by guest speakers, will explore the impact of science and technology on contemporary society". One of the goals of the program "is to develop position papers on the sociotechnological problems that will be studied in the program. These include defense policy, world food supplies, ecology, and population growth". It is not Long's intention to develop position papers for the government, "but we will probably find ourselves working with Congressmen on these difficult problems as individuals, not through the program". The two main reasons the program was developed are: (1) to inform the public and Congress of the "interrelation of science, technology and the world's problems", and (2) "student interest in courses that study the relevance of science to society". Long hopes eventually to raise about $250,000 a year for the program; to date, he has received what "Long calls 'a modest amount' from one foundation".

VI SCIENCE MANAGEMENT AND POLICY-MAKING BODIES

26. "The Analysis and Evaluation of Public Expenditures: The PPB System", A Compendium of Papers Submitted to the Subcommittee on Economy in Government of the Joint Economic Committee, Congress of the United States, Ninety-first Congress, First Session, Volume 2, Part 4, "The Current Status of the Planning-Programming-Budgeting System", 1969, pp. 613-798.

The nature and purpose of the Planning-Programming-Budgeting System (PPBS) is discussed and the progress made by the federal government in implementing the system is assessed. The report, prepared by Jack W. Carlson (Assistant Director for Program Evaluation of the Bureau of the Budget), appraises the effectiveness of the formal structure of PPBS ("only partially successful") and cites some areas in which the benefits of PPB are observable, including better definition of agency objectives, improved information on program inputs and outputs, a greater use of analysis is decisionmaking, more evaluation of programs, wider involvement of officials in the budget process, and comparisons of related programs in several agencies. Several programs are identified in which PPB analysis "assisted the decisionmakers", although the author suggests that the "role of analysis should not be overstated". As for the immediate future of PPB, the author sees little change in "form or substance", but some "changes in emphasis". Attachments to the report include examples of PPB usage and an annotated bibliography of selected papers in program and analysis. Overall, the author "asserts that PPB has been and continues to be moderately successful, and that it has been and will continue to be an important contribution to public policy decisionmaking".

(This report can be obtained from the U.S. Government Printing Office, Washington, D.C. 20402, Price: $.75).

27. Carpenter, R.A., "Science, Policy, and Congress", Midwest Research Institute Quarterly (MRI), Winter 1968-1969, pp. 4-7,20-21.

The growth of science and its effect upon public policy has created a major demand for scientific and technical information in Congress to enable legislators to make better decisions on the "expenditure of public funds". The author discusses the current need for information, the nature of this information, and the mechanisms for communication which have evolved as a consequence of the need for "an information transfer process from the scientific community". "Three significant changes occurred to make the understanding of science and technology important to members of Congress: public debate and commentary, large public funding, and a variety of national objectives depended on research and development results". In order to provide the required technical information, the Science Policy Research Division (SPRD) was established in 1965 to act as "a bridge to a diversity and plurality of information and opinion". The remainder of the article describes the functions of the SPRD, presents the need for greater participation by professional and technical societies in supplying information to Congress and offers several examples of the form this participation could take.

28. "President's Science Advisory Committee", Science, v. 164, no. 3880, 9 May 1969, p. 642.

"President Nixon on 24 April announced the appointment of five new members to his 19-member President's Science Advisory Committee. The new members, who will serve 4-year terms, are John D. Baldeschwieler, professor of chemistry, Stanford University; Richard L. Garwin, director of the IBM Watson Laboratory, Columbia University; Murray Gell-Mann, professor of theoretical physics, California Institute of Technology; Patrick E. Haggerty, president of Texas Instruments, Inc., Dallas; and Gerald F. Tape, president of the Associated Universities, Inc. The President's Advisory Committee advises the President on a broad range of government issues pertaining to science and technology. Lee A. DuBridge is chairman and Charles P. Slichter of the University of Illinois is vice chairman".

29. "Whatever Happened to COSPUP?", Scientific Research, v. 4, no. 12, 9 June 1969, p. 21.

"The committee on Science & Public Policy of the National Academy of Sciences isn't getting as much notice in the press as it used to but 'the work has been going on at fever pitch', says a COSPUP official. New reports either sponsored, supervised or reviewed by COSPUP are due for publication during 1969 in about this order:

- This month, a technology-assessment report for the subcommittee on science, research & development (one of three reports commissioned by this subcommittee as it prepares to propose legislation on the effects on man of technology, good and bad).
- In the fall, a report on behavioral and social sciences, three years in the making.
- Also this fall, a monumental report on the life sciences, prepared with a major assist from new NAS President Philip Handler.
- Late this year or early next, a report on population -- in cooperation with the British Royal Society.

Chaired originally by George Kistiakowsky and then by Harvey Brooks, both of Harvard, COSPUP had hoped to lay the groundwork for some national decisions on priorities in science. That goal remains just that -- a goal".

30. Mayo, L.H., "The Technology Assessment Function", Part I, Internal Reference Document 25, Program of Policy Studies in Science and Technology, The George Washington University, July 1968, 55 pp.

> This document is an introduction to "technology assessment", the meanings of the term, the scope of the interest and activity involved, the present means of assessment and the current congressional concern with improving these means. The first chapter documents the "emerging interest in technology assessment"; the second presents "concepts relevant to an analysis of the technology function", including a listing of the types of questions involved in assessment and general guidelines for proceeding to answer them. The third chapter describes some of the major existing mechanisms and structures for performing assessment. The fourth chapter reviews "congressional expressions of need for more adequate technology assessment", comments on Congressman Daddario's original statement on the topic, and suggests an information flow model for identifying "areas of technological application likely to be of concern to Congress. The fifth and final chapter suggests some schemes for classifying facets of technology "meriting continuing congressional attention".
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> (For information on how to obtain this report, write to the Program of Policy Studies in Science and Technology, The George Washington University, Washington, D.C.).

31. Mayo, L.H. and P.L. Rao, "The Technology Assessment Function: Illustrative Cases of the Assessment of Technological Applications", Part II, Internal Reference Document 25, Program of Policy Studies in Science and Technology, The George Washington University, July 1968, 50 pp.

> The purpose of this study is to use the two basic analytical components developed in Part I (above) "to explore a sampling of technological applications and pose questions relating to the adequacy of the information provided to Congress [on] the impact of such applications". The basic analytical components utilized were (1) the Classifications of Technological Applications and (2) the Information Flow Model. "The results of this inquiry should be helpful in developing the tasks that need to be performed for Congress (and appropriate institutional mechanisms for executing such tasks) in more adequate assessment of various technological applications". Some of the areas of technological application examined were (1) those producing unrecognized, undesirable effects (medical devices, laser technology); (2) those producing recognized detrimental effects considered of little significance (gas pipeline safety); (3) those where assessment has been institutionalized but in which a "breakdown or malfunction" has occurred in the system (aircraft engine failures, "Wonder Drug" DMSO); (4) those "novel" or "abnormal" assessment situations where there is no regular assessment system and for

which no institutionalized system is likely to be established (supersonic transport, Project West Ford); (5) prospective new uses for existing technologies (computers); (6) prospective applications of new or emerging technologies (weather modification).

(For information on how to obtain this report, write to the Program of Policy Studies in Science and Technology, The George Washington University, Washington, D.C.).

32. Myrick, R., et al, "Some Research Approaches to Studying the Development and Functioning of Technology Assessment - Control Processes", PB 182 872, The George Washington University, Washington, D.C., 1969, 30 pp.

This report presents outlines of seven possible research studies in the area of technology assessment. The studies aim at learning more about the emergence, growth, and functioning of assessment-control processes in American society. Each of the suggested pilot studies described deals with a different aspect of the technology assessment-control process [TACP] and utilizes different research approaches. The studies suggested are: (1) Compilation of Case-Histories as Raw Materials for the Study of the Development and Functioning of TACP; (2) A Test of the "Crisis Theory" of the Emergence and Development of TACP; (3) Determining Some of the Essential Conditions for an Effective TACP; (4) A Short Introductory "Handbook" of TACP; (5) Analysis of TACP Construing It as a Small Science; (6) Examination of the Feasibility of Incorporating an Adapted "Distant Early Warning" Feature into Certain Existing TACP; and (7)"Analysis of the Feasibility of Incorporating System Management Techniques into Assessment-Control Organizations Seeking to Control Specific Adverse Effects Such as Environmental Pollution, Resulting from Certain Technological Applications".

(The report can be obtained from the Clearinghouse for for Federal Scientific and Technical Information, Springfield, Virginia 22151, Price: $3.00).

33. Martino, J.P., "Forecasting the Progress of Technology", Air University Review, v. 20, no. 3, Aerospace Studies Institute, Maxwell Air Force Base, Alabama, March/April 1969, pp. 11-20.

"How can the planner determine what the technology of the future will be like, so that he can take account of it in his plans and decisions?" According to the author, the answer "involves an art and science known as 'technological forecasting'". In this article several concepts of technological forecasting are described and five of the most widely used methods for making forecasts are discussed. These methods include: intuitive forecasts, consensus methods, analogy, trend extrapolation, and structural models. For each of the methods, the basic steps in analysis and prediction are presented, the unique characteristics are described, and the relative accuracy and objectivity of each is evaluated.

34. Boffey, P.M. and B. Nelson, "NSF Director: Nixon Admits He Was Wrong", Science, v. 164, no. 3879, 2 May 1969, pp. 532-534.

The admission by President Nixon that he "has been wrong in blocking the appointment of Franklin A. Long for political reasons as the new director of the National Science Foundation" is discussed. In asserting that the NSF directorship "is a nonpolitical post", Nixon established that federal research funding is also a nonpolitical area. The scientific community, by bringing about pressure to bear on the President in this matter, has "proved itself powerful enough to persuade the President that he made a mistake". In fact, the pressure was so effective that Nixon offered the directorship of NSF to Long, but the latter refused because, he said, "The earlier events had inescapably made me become a politically marked and polarized figure". Nixon assured the National Science Board and the Council of the National Academy of Sciences that the next NSF director "would be chosen on the basis of scientific and administrative competence and would be chosen from names submitted by the National Science Board". The explanations offered by Nixon and DuBridge for the blockage of Long's appointment are also discussed.

35. "Dr. Vinciguerra Prescribes for the NSF", Scientific Research, v. 4, no. 10, 12 May 1969, p. 21.

"One of the most closely guarded documents in Washington these days is the management report on the National Science Foundation commissioned last November by the National Science Board. A first draft of the report, pulled together by John V. Vinciguerra of the Atomic Energy Commission, was completed early this year and submitted to Foundation Director Leland J. Haworth for review. Haworth has declined to comment publicly on the report, presumably wishing to leave that to his successor". "Distribution of the report has been extremely restricted, but an informed source says its main feature is a series of alternate ways of using the four new assistant directors, not yet selected, whose jobs were set up in the NSF reorganization act passed by Congress last year. Of five possible schemes, the favored one would give three of the aides direct managerial responsibility reporting to the director, with the fourth man acting as a trouble-shooting roving ambassador. The draft report also apparently calls for upgrading some functions within the Foundation. The policy and planning office was especially singled out as needing more staff and rank. The idea is that a broader, deeper staff should be available to help formulate the policy recommendations that Congress is demanding of the National Science Board".

36. Nelson, B., "HEW: Finch Tries to Gain Control Over Department's Advisory Groups, Science, v. 164, no. 3881, 16 May 1969, pp. 813-814.

    HEW Secretary Finch "has ordered a complete review of all his department's public advisory committees", "a moratorium on the appointment of all new committee members through 31 August", and "affirmed his intention to keep the appointment power to HEW committees in the office of the Secretary". These actions, scientists fear, will lead to "more attempts to install political appointees, not only on the advisory councils which advise on policy in the medical area, but also on the study sections which, in large part, determine how the research money will be allocated and what projects will be chosen for funding". In the past, appointments to committees in NIH and NIMH were controlled "largely by administrators in these agencies and by university scientists". The new procedure would entail submission of names "both from the White House Talent Bank" and from congressmen to the various HEW agencies for appointment to advisory committees. In addition to these changes, guidelines established for the committees include: (1) "A continuing evaluation of the usefulness and effectiveness of each committee"; (2) "The number of committees will be kept to a minimum"; (3) Agencies must make an annual evaluation "of a member's performance before his reappointment is recommended"; and (4) "Multiple memberships on committees will be avoided". The reaction of several scientists and administrators to the new procedures are presented.

37. Nelson, B., "Scientists Increasingly Protest HEW Investigation of Advisers", Science, v. 164, no. 3887, 27 June 1969, pp. 1499-1504.

    "The process for investigating prospective appointees for scientific advisory groups in the Department of Health Education and Welfare has come under more scrutiny and protest". The scientific community finds the actions objectionable on these counts: "(i) grounds for rejection of appointees are veiled in secrecy; (ii) the rejections often appear arbitrary and based on irrelevant information; and (iii) there is no provision for appeal or for confrontation of the evidence which is being used to disquality a scientific adviser". Scientists who had been rejected by HEW on "nonscientific grounds" as well as HEW officials have denounced the present security system. Moreover, some 25 scientific and medical organizations asked "for abolition of security checks for nonsensitive advisory positions or, at the least, an opportunity for scientists to know and challenge the information being used against them", but little appears to have been done by HEW. Nelson points out that many people are concerned that these "security checks" may eliminate "some of the more adventurous and imaginative scientists from advisory appointments" and that the "investigation system will make scientists cautious about expressing their political views". The article includes brief interviews with some of the scientists rejected for advisory group appointments.

38. "A 'Hoover Commission' Recommended for R&D", Industrial Research, v. 11, no. 5, May 1969, p. 44.

A recent General Accounting Office (GAO) study recommended that more uniform procedures for paying nonprofit organizations be established. "Fees charged to the government currently range from an average of 4.7 to 6% at the Rand Corp. ... to no fee at all" in other organizations. "At stake is not the $9 million paid in fees to these institutions each year ... but what they do with the money. The GAO report ... notes that some of the money is going into enterprises inimical to government interests. The approach recommended by GAO is a complete review of the situation by a presidential task force". "Government-wide guidelines suggested by GAO would prohibit, among other things, use of fees for accumulating cash reserves, performing independent research, acquiring permanent facilities, and financing diversification into fields other than those specified by the sponsoring government agency". "Independent nonprofit institutions would not be directly affected by any proposed guidelines other than the impact under government work".

39. "No Change Seen in Research Charges", Scientific Research, v. 4, no. 13, 23 June 1969, pp. 13,15.

The General Accounting Office (GAO) report concerning the accounting procedure on government-sponsored research and billing of indirect costs, has not been released but its essential points were covered in recent testimony before the subcommittee on government research. The "GAO considers it unrealistic to insist that indirect costs be limited to a given percentage of direct costs". Placing "a limit on indirect costs would motivate the universities to treat many of the research costs they formerly considered as indirect as direct, and that procedure would simply add to overall costs". "The GAO also opposes a limitation ... although it agrees that more uniformity than presently exists in determining indirect costs is both feasible and desirable. The GAO study included an examination of cost-sharing and recommended that it be made voluntary". "The GAO feels that if the Congress wants to continue mandatory cost-sharing features (research contracts do not have cost-sharing features) well defined and uniform standards should be established".

40. "Grants and Contracts May be Standardized", Scientific Research, v. 4, no. 11, 26 May 1969, p. 17.

"The Bureau of the Budget is urgently working on a standard research agreement to replace some of the many kinds of agreements for federal research grants and contracts now in use. This was revealed by Phillip S. Hughes, deputy director of the Bureau, at hearings on cost accounting before Sen. Fred Harris' subcommittee on government research early this month. The Bureau has borrowed two full-time investigators from the National Science Foundation and the Atomic Energy Commission who are working with accounting experts from several other federal agencies to try to draw up guidelines for the new agreement before Congress adjourns. 'We would like to eliminate some of the difficulties encountered by universities in having to prepare proposals or make financial reports on a different basis for different agencies,' Hughes said. Guidelines will also be established on when to use a grant and when to use a contract".

VII SCIENCE, FOREIGN AFFAIRS, AND NATIONAL DEFENSE

15. Fawcett, S.L., "Adapting Technology to Encourage Economic Development", Paper presented at the Tenth Meeting of the Board of Governors, Inter-American Development Bank, Guatemala, 9 April 1969, 15 pp.

Means and prerequisites for the transfer of technology are discussed as they relate to economic and industrial development of Latin America. The author starts with a broad definition of technology that encompasses management, manpower, and marketing factors as well as the usual "technical know-how", identifies types of technology "that can be transferred to any developing nation", and assesses their relative applicability and effectiveness. He then presents some of the prerequisites for successful transfer and suggests a number of complementary mechanisms for effecting the transfer. Of the five categories of technology discussed, Fawcett believes that the adaptation of "current techniques or processes" from developed nations will produce "the greatest effect" in Latin America. The success of the transfer depends crucially on creating an environment that favors change: the development of a national science policy and the desire for technological change by the industrial sector are seen as major factors leading to this "environment". Suggested methods for accomplishing the adaptation, or transfer, are technical planning ("a means for evaluating resources), information management ("a means for providing knowledge"), training ("a means for providing action").

(The paper can be obtained by writing the author at Battelle Memorial Institute, 505 King Avenue, Columbus, Ohio 43201).

16. Root, F.R., "The Role of International Business in the Diffusion of Technological Innovation", The Economic and Business Bulletin, v. 20, no. 4, Summer 1968, pp. 17-25.

"Examination of the role of international business in the diffusion of technological innovation ... reveals that the multi-national company ... functions as an international-innovation system that goes far beyond the classical mode of technological diffusion through imitation". The author describes the technological innovation process in terms of its linkage role between R&D, production and the market; points to the major importance of market research in guiding R&D; and provides examples of the relationship between "high levels of R&D expenditures, high rates of product innovation, and high growth rates" of major American industries. He presents examples of the "internationalization of the entire innovation system" as the means of overcoming innovation gaps. He concludes that "international business contributes far more to technical innovation in the industry of developing countries than all of the technical assistance and other aid programs sponsored by governments".

17. "Full Exchange Programs Reinstated with USSR, East European Academies", News Report, National Academy of Sciences, National Research Council, National Academy of Engineering, v. 19, no. 6, June-July 1969, p. 2.

    "Having been forced last fall to retrench in its exchange programs with the Soviet and some East European academies because of a marked cutback in financial support from the National Science Foundation ... the National Academy of Sciences has subsequently been able to reinstate virtually all of the programs at their original levels in the current year. This is due to the restoration of most funds by the NSF". The NAS "had been compelled to reduce the exchange program with the Soviet Academy from about 90 months of visits in each direction for the year to 52, and to reduce the program with the Polish Academy from 40 to 27 months. Plans for commencing exchange activities with the Hungarians and Bulgarians were put in abeyance, but they, too, are once again active. The NAS has reinvited the Hungarian Academy to send a delegation to survey research in this country in return for the NAS delegation's visit in Hungary in 1966. It is hoped that the Hungarian Academy delegation would be empowered to conclude arrangements for a continuing exchange of scientists. A comparable program with the Bulgarian Academy is also envisaged within the coming year".

18. "A French-U.S. Cooperative Program in Marine Sciences Underway", International Science Notes, no. 22, May 1969, p. 18.

    "The concept of an informal joint French-U.S. program of cooperation in the Marine Sciences originated with Dr. Edward Wenk, Jr., Executive Secretary of the National Council on Marine Resources and Engineering Development (Marine Sciences Council) and M. LaPrairie, Director of the Centre National Pour Exploitation des Oceans (CNEXO) early last year in Washington. The initial proposal developed led to informal letters exchanged by Wenk and LaPrairie in which five areas of potential cooperation were identified. These were: Fish Protein Concentrate, Ocean Pollution, Research Personnel Training, Technology of Deep Diving, Buoy Technology. The U.S. agencies responsible for pursuing exchange were selected by the Marine Sciences Council: (a) Department of Interior, (b) Federal Water Pollution Control Administration, (c) National Science Foundation, (d) Office of Naval Research, (e) Department of Transportation. Recently papers were received from the French experts in the five areas pinpointing the sectors of potential cooperation more closely. Their American counterparts are presently in the process of responding and narrowing these sectors to those which have the greatest potential of mutual benefit to both countries. A meeting of the five Americans during March under council auspices indicated that the program was off to a successful start. Specific collaborative projects of mutual advantage are being identified".

(International Science Notes is prepared by the Office of General Scientific Affairs, U.S. Department of State, Washington, D.C. 20520).

19. "Helios Adds Lustre to German Space Programme", New Scientist, v. 42, no. 655, 26 Junr 1969, p. 696.

An agreement between Germany and the U.S. has recently been signed to begin Project Helios. This project "provides for the launching of two solar probes, each with 10 experiments on board, to pass within 50 million km of the Sun. Germany is to be responsible for the development and control of the probe itself, as well as for seven of the onboard experiments. The other three experiments are to come from the Goddard Space Flight Centre, in collaboration with American, Australian and Italian scientists. The project has been planned to provide new information about the processes on the Sun via studies of the solar wind, the magnetic and electric fields, the cosmic radiation and the cosmic dust". According to the Federal Minister of Scientific Research, "the costs of the Helios project will amount to about 353 million marks, of which the Federal Republic will provide about 233 million over the five years 1969-74". "Minister Stoltenberg and Dr. Paine [director of NASA] also signed a further agreement covering the development and construction of an Aeronomic satellite". "Once again, the Germans are to provide the satellite and the majority of the experiments". "The Germans are confident that these two projects will greatly improve their capability in the space field, and that further large-scale projects will follow in their wake".

20. "Science Developments Associating the U.S. with the Republic of China, International Science Notes, no. 22, May 1969, pp. 14-16.

Some of the actions recently taken to forge closer working relationships between the scientists of China and the U.S. are discussed. Events leading to these actions include: the Sino-American Science Cooperation Program; a visit to Taiwan in 1967 by F. Hornig, Science Advisor to the President and a team of experts to assess Chinese science needs and assets; and the creation and filling of a new post of Special Assistant to the Ambassador for Science and Technology. Several actions already have grown out of this latter venture, including a "medical mission to the Republic of China", a

"Sino-American workshop on the industrial application of science", an "advisory visit ... to discuss China's oceanographic program"; and "the transfer to the Chinese Government of ... a U.S. Navy oceanographic research vessel, which the Chinese plan to integrate with their marine sciences activities". China is allocating the equivalent of $25,000,000 for FY 69 to strengthen its scientific institutions and research capacity. This is the first year allocation for a 12-year science development plan. The remainder of the article discusses special groups being formed to define "the mechanics and the refining of the goals of joint cooperative endeavors".

(International Science Notes is prepared by the Office of General Scientific Affairs, U.S. Department of State, Washington, D.C. 20520).

21. "U.S.-China Agreement for Scientific and Technological Cooperation", International Science Notes, no. 22, May 1969, pp. 16-17.

The United States and the Republic of China have formalized in an agreement actions to promote cooperation in science and technology. "The substantive points of the Agreement were set forth within an Exchange of Notes". Briefly summarized, the major points of the agreement are as follows: (1) "The aim of the cooperation will be to increase the contracts and cooperation between scientists ... and to provide them with more frequent opportunities to exchange information". (2) "The scope of the cooperation will cover all recognized branches of science and technology". (3) "Each government will designate an executive agency, whose responsibility will be the coordination of the implementation of its side of the joint programs ... For the Government of the Republic of China, this agency will be the National Science Council, and for the ... United States ... the National Science Foundation". (4) "Information ... shall be made available to the world scientific community through customary channels and in accordance with the normal procedures of the participating agencies". (5) Except in exceptional cases, each "government shall ... bear the costs incurred in the discharging of its respective responsibilities". (6) "The Agreement shall ... remain in force for six years unless renewed upon mutual consent".

(International Science Notes is prepared by the Office of General Scientific Affairs, U.S. Department of State, Washington, D.C. 20520).

22. "How Manageable Is Fallout from 'Plowshare'? The Debate Continues", New Scientist, v. 42, no. 650, 22 May 1969, p. 401.

This article outlines the potential hazards involved in "cutting a second canal across the Isthmus of Panama" by means of nuclear excavation. Opinions of the hazard to the Panama population are divided. Two researchers attached to the U.S.

Environmental Science Services Administration (Gilbert Ferber and Robert List) believe that the "safety problems are manageable". Dr. Robert Pendelton, director of the University of Utah's radiological health program, on the other hand, claims that government surveillance of radioactive aerosols is adequate and inhalation of radioactive particles presents a real hazard to Panamanians. The author of this article concludes that the large number of unknowns involved in operation "Plowshare", together with the inconveniences involved in the necessary shifting of Panama's population during the blasting period, leads one to wonder "if the Panamanians would not do better to hark to the voice of the biologists rather than to that of the nuclear technologists".

23. Boffey, P.M., "CBW: Pressures for Control Build in Congress, International Groups", Science, v. 164, no. 3886, 20 June 1969, pp. 1376-1378.

"The highly classified issue of chemical and biological warfare (CBW) is under intense public scrutiny this year as pressures build up to bring germ and gas weapons under stricter control". This article reviews the activities in this area, indicates "the dollar magnitude of the American CBW program", and briefly discusses the difficulties in obtaining an arms control agreement on CBW. "Several Congressional subcommittees have recently held hearings on aspects of the U.S. Army's CBW program", including open-air testing and the plan "to dump chemical weapons into the ocean"; these hearings "are notable for their reflection of deep-seated hostility and skepticism among congressmen toward the military CBW program". "The most powerful thrust toward CBW arms control ... may come from several international studies now under way"; these include studies by the U.N. Disarmament Committee, the World Health Organization, and the International Institute for Peace and Conflict Research.

24. "GAO Report", Science, v. 164, no. 3882, 23 May 1969, p. 935.

"The General Accounting Office (GAO) has issued a report charging that Defense Department contractors have apparently been using government procurement funds for research and development (R&D) activities. Noting congressional interest in the funding of R&D and of the possible harmful effects on the management and control of R&D activities, the GAO singled out Air Force contracts for MINUTEMAN missile motors that may have involved a misuse of nearly $22.5 million in funds, and then proposed that full disclosures be made in program budget submissions to show how funds are being used".

25. "Closing Laboratories in Fund Cut", Washington Science Trends, v. 22, no. 4, 5 May 1969, p. 21.

> "The Nixon Administration has ordered the consolidation or closing of several major research and development establishments in an economy move expected to result in a $29.2 million annual 'saving'. Defense Secretary Melvin Laird said the Army and Navy have determined that their R&D establishments should be reoriented to meet present and future needs". Although the Army and the Air Force will be affected, the major change affects the Navy. The laboratories to be consolidated or closed are listed for the Army, Air Force and Navy. "These actions are part of a program in which 36 military installations in the U.S. will be consolidated, reduced, realigned or closed, at an estimated savings of $95 million annually. Further, some 6,222 military personnel will be made available for other assignments, and some 3,028 civilian job positions will be eliminated, although civilians will be offered another job opportunity".

VIII SCIENCE POLICY IN FOREIGN COUNTRIES

International

77. "Quickening Pace in Europe", Nature, v. 222, no. 5196, 31 May 1969, pp. 823-825.

This issue of Nature presents a survey of national developments in science and technology in several European countries, and identifies some of the more general and salient features of these developments for the countries as a whole. Common features discussed include: the rapid growth of science and technology in several Western European countries; the causes of the rapid growth (chiefly, "the wish to keep up with the United States"); the "remarkably uniform" public policies developed for science and technology in several countries; recognition of the importance of a separate government agency responsible for science and technology; discovery of the high payoff from the employment of scientists and engineers in industry, and the problems of doing so; the pressing need for university reforms; and the desirability of cooperative efforts among countries in science and technology, and the difficulty of achieving them. (Separate articles dealing with the individual countries covered in this survey are cited under the national designations in the latter part of this section).

78. Kahn, R.S., "Expanded Role in Space Sought for U.N.", Aviation Week & Space Technology, v. 90, no. 21, 26 May 1969, pp. 57,59,61.

Recommendations for bringing the applications of space technology to small and non-space powers were made to the U.N. Committee on the Peaceful Uses of Outer Space by its Scientific and Technical Subcommittee. Proposed by India, and backed by several small nations, the recommendations call for the appointment of an official to serve as a point of contact for member states seeking space applications; panel meetings for promoting collaboration with space organizations; assistance from the U.N. Development Program for survey missions, panel meetings, and fellowships; investigation of the use of earth resource satellites; and dissemination of information concerning opportunities for education and training in space related fields. These and other related recommendations are to be submitted to the Committee at its next session scheduled for September. Points of debate, primarily between the large and small powers, concerned whether "new technical assistance was required, as proposed by India, or whether existing machinery was sufficient, as suggested by the United States". In this connection, the U.S. representative on the Subcommittee, Arnold Frutkin, observed that the "only two applications of space technology substantially available today are in ... meteorology and communications, in both of which U.N. agencies are active". He also pointed out the general lack of utilization of already available space information by the smaller countries.

79. "OECD: International Organizations -- Coordination and Exhortation", Nature, v. 222, no. 5196, 31 May 1969, pp. 840-841.

Some of the successes and shortcomings of the Organization for Economic Cooperation and Development (OECD) are cited and briefly discussed in this short article. "If policy in science and technology is now a tangible activity distinct from other kinds of public administration ... a good part of the credit should go" to OECD. Success in this area "stems from the way in which the scientific secretariat ... has been able to identify problems which are plainly meaningful". This, coupled with the series of detailed examinations of national science policy carried out by OECD, "has been directly responsible for prompting some European nations to increase their expenditure on research and development". Still another successful activity is OECD's arrangements for "meetings of science ministers ... to explore ways in which the efficacy of research and development in Western Europe might be improved". On the negative side, "OECD has been less successful at building institutions for collaboration in science and technology" and for "the management of research". But "the most serious defect in the present influence of OECD on the development of science policy in Europe" may be the way in which the "simplest analyses of present circumstances tend to be accepted as universal lessons". There is also the "suspicion" that OECD has slighted academic research "for the sake of winning a quicker economic return from funds invested in [R&D]".

80. Greenberg, D.S., "Technical Cooperation: Big Boost from DeGaulle's Resignation", Science, v. 164, no. 3883, 30 May 1969, pp. 1042-1043.

Prospects and problems of technical cooperation among Common Market members, following DeGaulle's departure, are reviewed and discussed. "Within a Common Market expanded in size and power, the most easily implemented activities would be those in the industrial field, where the impulse for cooperation would benefit greatly from common policies on patents, freedom of movement for employees, and, perhaps most of all, the presence of Britain as a cooperating rather than a competing force". Some potential efforts in this direction are cited: a possible integration of the computer industries of several countries into a combine, a cooperative venture to construct centrifuge plants for uranium enrichment, and an expansion of Euratom activities into such fields as data processing, telecommunications, transportation, metallurgy, and pollution control. Impediments to "Europe's coming together, or working well if it does", are the weak political strengths of many of the present European governments, and the threat of student movements which are "bound to discover that the design of Europe's technocrats do not necessarily mesh well with their own visions of an agreeable society".

81. "Technology: Uniting to Manage", Nature, v. 222, no. 5196, 31 May 1969, pp. 835-836.

A brief historical account of efforts to establish an European Institute of Technology is presented and the prospects for its financing are discussed. "The history of the project goes back to a conference ... in May 1967 to consider the technological gap between Europe and the United States. The outcome was a recommendation to explore the possibility of an international institution of higher education designed to ensure speedier technological progress in Europe. The study committee that was set up produced its final report in May 1968, proposing a European centre for advanced courses and research concerned with the techniques of industrial management". A site and buildings, valued at $1 million, have been offered by both Italy and the Netherlands. Each of these "two governments have also promised support ... of about $100,000 for the first year, wherever the institute is set up. The West German Government has provided $25,000, with an understanding that a proportionate contribution will be forthcoming in future years, when expenditure on the institute will increase. The British Government has promised $24,000 for the preparatory year, but is not yet entirely happy about the functions of the institute, and wishes to have the opportunity of discussing aims and objectives during the first year before committing itself further".

82. Star, J., "European Physicists Rush in Where Politicians Fear to Tread", Scientific Research, v. 4, no. 12, 9 June 1969, pp. 38-41.

The composition and goals of the recently created European Physical Society are described. Eighteen nations, including the USSR and four Eastern European countries, are members of a Society which is headquartered in Geneva. "The immediate goal of the Society is to bring some order out of the confusion of overlapping national scientific endeavors by coordinating the physics research, publications, summer schools, and conferences now operated on a national basis". By "serving as both forum and clearinghouse, the Society expects to cut down on wasteful research duplication and save money for its member nations". Longer range goals include the promotion of student exchanges and fellowships, greater uniformity in physics teaching, a system of information retrieval, abstracting services, and possibly the creation of an information center. Financial support for the Society will come from membership dues, foundations, nonprofit organizations, and industry. Direct government aid is prohibited, but indirect support such as grants will be accepted.

83. "Euratom, Phoenix or Dead Duck?", Nature, v. 222, no. 5196, 31 May 1969, pp. 838-840.

The status, plans, and prospects of Euratom are analyzed and discussed. "One of the saddest features of the European Common Market is the way in which Euratom, one of the most hopeful of all collaborative ventures as recently as ten years ago, has now sunk to its knees under the weight of the political and industrial pressures which have assaulted it". "In a curious way, Euratom has served not so much as a means of cooperation as a device for intensifying the competitiveness of its members". Some of the possible causes of the "failure" of Euratom are suggested (e.g., the attempt by Euratom to develop reactors on its own without involving industry, and the competitive nuclear developments undertaken by member nations), and the new plans for the organization are discussed. In these plans, Euratom draws "attention to the foolishness of the parallel development of different types of reactors in several member states", and calls instead for 'the restructuring of the nuclear industry on a multinational basis' with Euratom as the coordinating agency. In addition, Euratom proposes to diversify into such areas as pollution abatement, material sciences, and data processing. The prospect for either of these proposed efforts is regarded as dim.

84. Kolcum, E.H., "Four ELDO Members Agree on Launches", Aviation Week & Space Technology, v. 90, no. 17, 28 April 1969, pp. 24-25.

The financial problems and planned activities of the European Launcher Development Organization (ELDO) are briefly reviewed. Ministers of the ELDO member nations "have reaffairmed that the expenditure limit for the complete program through 1971 will be \$626 million, and that the 1969 budget will be \$81.4 million". "Great Britain, which will pull out of ELDO completely in 1971, will pay \$24 million over the next three years. Italy also is expected to leave when the current protocol ends, but has agreed to contribute only \$3.5 million toward the 1969 budget". "Exactly how the reduced commitments of Britain and Italy will be absorbed by the other four paying members is now being negotiated". "With the possible exception of West Germany ... none of the surviving members of ELDO will easily find the additional money to continue the ELDO organization". Recent action by the ELDO ministerial conference assures a four-launch program through 1971; two launches in 1969 with Europa 1 will be made from Woomera, Australia range, followed by two launches of Europa 2 in 1971 from the Kourou range in French Guiana.

85. "An International Laboratory Needed", Nature, v. 222, no. 5196, 31 May 1969, pp. 836-837.

The financial difficulties of the European Molecular Biology Organization (EMBO) are described and the need for a laboratory is discussed. The organization, which was set up in 1963, has been financed chiefly by the Volkswagen Foundation under a three-year grant that ended in December 1968. In early 1969, 12 European governments established a Conference which agreed to take on financial responsibility for EMBO. However, ratification of the agreement will not be completed before current operational funds are exhausted. An interim meeting of the Conference has been called to deal with this problem, as well as to consider the question of establishing a laboratory for molecular biology. Such a laboratory, which is viewed as the only solution to the problems of American dominance in molecular biology and the "brain drain", is expected to "cost $7.7 million to build, $7.8 million to equip initially, and, once in full operation, about $8.5 million annually to run". Until this laboratory can be set up, "EMBO will presumably have to content itself with running its fellowship programmes, organizing visiting professorships and financing and organizing workshops and teaching courses".

86. "Swedish-French Scientific Exchanges", International Science Notes, no. 22, May 1969, pp. 17-18.

The Swedish-French Research Association was formed in 1967 to spur scientific and technical contact between the two countries. The form of the exchange arrangement and the activities of the Assocation are described. The Association includes representatives from the Swedish Medical and Natural Sciences Research Councils, the Board of Technical Development, the Royal Academies of Sciences and Engineering, and the Forestry and Agriculture Academy, as well as representatives from corresponding French organizations. Activities of the Association in 1968 included grants to Swedish researchers and engineers for training in France, a joint symposium on the application of research results in industry, and visits and lectures in each country. For 1969, more of the same is planned including training positions for young scientists and engineers, exchange grants for basic and applied research, and theoretical physics. Overall, the program appears to have been successful in increasing the scientific and technological exchanges between the two countries.

(International Science Notes is prepared by the Office of General Scientific Affairs, U.S. Department of State, Washington, D.C. 20520).

Australia

87. "Australians to Survey Their R&D", Scientific Research, v. 4, no. 9, 28 April 1969, p. 17.

> The Australian Ministry of Education and Science has been given the task of setting up a national inquiry, Survey of Comparisons of Research and Expenditure (SCORE), to investigate research projects, expenditures, and work duplication. In scope, "the inquiry will cover federal and state departments, universities and colleges, non-profit organizations, and industry". "The findings will provide background information for future government decisions", according to Malcolm Fraser, Minister for Education and Science. The inquiry was initiated because of criticism of "lack of opportunities for scientists and engineers, and the parallel lack of research" in Australian and foreign-owned industry. In this connection, the government is "attempting to persuade industry to do more research by paying subsidies for company projects, although these currently total less than $1 million annually".

88. "Science Advisory Plan Rejected", New Scientist, v. 42, no. 645, 17 April 1969, pp. 104-105.

> The Australian Academy of Science recently sponsored a meeting of leading scientists, industrialists, and administrators from various Commonwealth departments to "frame a national science policy". To that end, the Academy proposed a "centralized scientific advisory body", similar to those developed in Britain, Canada, and the United States. The proposal was rejected by the Minister of Education and Science, who in his address to the assembly, let it be known "that the government preferred its own planning for science and technology". "We may be wisest to continue ... seeking advice from different people as different projects arise", and in this way to establish a "network of informal ad hoc relationships", he said. However, in rejecting the concept of a centralized science advisory body, the Minister "opened the way for a more effective partnership between government, university, industry and other groups", and towards this end the Australian Academy of Science is investigating means for the "use of science in Australian industry". A related activity is Project SCORE (Survey and Comparison of Research and Expenditure) which when completed will provide facts and figures on research in Australia that are needed to set a science policy for the country.

Belgium

89. "Science Policy in Microcosm", Nature, v. 222, no. 5196, 31 May 1969, pp. 834-835.

Problems in the national science policy of Belgium, especially government-university relationships, are reviewed and described. The "archaic ... schism between French-speaking Belgium and Flemish Belgium", and the myriad ramifications from it, are viewed as the major problem of Belgium's science policy. The close linkage of science, the university, and government comes about because the "whole cost of the university programme ... is ... carried on what is called the science budget". The latter "is the responsibility of the National Council for Science Policy, which is also responsible for the administration of the funds which eventually find their way into research and development within and outside the universities". This, plus criticism of the methods for funding academic research, creates "tension between the Government and the universities", with the Government tending "to regard the universities as antiquated institutions" and the universities feeling pressured into becoming "teaching institutions, in which research is a kind of luxury". Other topics covered are expenditures for R&D (up 14.6 percent over 1968), and areas receiving the greatest increases (technological research in atomic energy, management studies, government laboratories).

Brazil

90. "K.O. Blow Hits Brazilian Science", Scientific Research, v. 4, no. 10, 12 May 1969, pp. 17-18.

"Brazilian science was dealt a crushing blow in the last week in April from which it may take many years to recover. Some 70 professors at the Federal University in Rio de Janeiro and at the University of Sao Paulo were summarily 'retired'" by the government. Among those 'retired' "are the president of the University of Sao Paulo and several heads of departments at both universities". "Worst hit at the universities are physics and sociology, but biochemistry has also suffered". "The 70 men ... received no warning, and learned of their fate over the radio. They have not been charged with any offense, and no arrests have been made". Possible reasons for the "sudden compulsory retirement" are briefly discussed.

Canada

91. "Proceedings of the Special Committee on Science Policy", The Senate of Canada, First Session, Twenty-eighth Parliament, Nos. 34-45 (March 1969 - May 1969), Queen's Printer and Controller of Stationery, Ottawa, Canada, 1969.

    These hearings, held in March, April, and May 1969, are a continuation of the efforts of the Canadian Senate to study Canada's science policy, "with the object of appraising its priorities, its budget and its efficiency". Organizations presenting testimony, by document number, are as follows:

    No. 34: Department of Finance
    No. 35: Science of Science Foundation
    No. 36: Treasury Board
    No. 37: Post Office Department
    No. 38: Department of External Affairs
    No. 39: Representatives of Universities
    No. 40: Department of Regional Economic Expansion
    No. 41: Canada Council
    No. 42: Department of Industry, Trade and Commerce
    No. 43: Representatives of Universities
    No. 44: Association of Universities and Colleges of Canada
    No. 45: Representatives of Universities

92. "Framework for Forward Planning", Nature, v. 222, no. 5198, 14 June 1969, pp. 1024-1026.

    "Canadian science is now well on the way to being the best managed, or at least the most self-consciously managed, of any country in the West". In their latest report, The Role of the Federal Government in Support of Research in Canadian Universities, the Science Council of Canada and the Canada Council put forward far-reaching suggestions for the reorganization of the policy-making bodies concerned with Canadian science". The report calls for the continuation of the number of "research councils with responsibility for university research", but proposes several major changes in responsibility: the National Research Council (which receives about 50 percent of the total R&D budget) should give up control of its laboratories; the mission of the Medical Research Council "should be broadened so as to cover research in all branches of science related to health"; and support of the social sciences should be removed from the Canada Council and vested in the Humanities and Social Sciences Council. Other topics covered in the report are expenditures for R&D, the problems of relating research and social goals, the need for greater funding in the social sciences, a greater variety of grants for university research, allowable overhead for research grants, classified research, and graduate education.

93. Pankhurst, K.V., "Scientific Manpower: A New Government Study to Help Us Use It Wisely", Science Forum, v. 2, no. 2, April 1969, pp. 3-6.

The research program of Canada's Department of Manpower and Immigration for the study of engineering and scientific manpower is reviewed and discussed. The main aims of the program "are to make projections of future requirements and resources, to investigate the utilization of the type of manpower, and to analyze the working of this part of the labour market". A 1967 survey made by the Department is described, and some data from it are presented to show (1) the percentage of scientists and engineers, by field of study and occupation group employed in Canada, (2) the percentage of foreign born technical personnel in different occupational groups, and (3) the level of education and country of graduation as a percentage of employment in each level. These latter data show that some 20 percent of the scientists and engineers with a Master's degree and 33 percent of those with doctoral degrees have graduated in the U.S. In regard to the "brain drain", the author suggests that "although there may be a net movement to the [U.S.] it is much smaller than has been thought, and if account is taken of the higher educational level of those coming from the [U.S.], Canada may have an economic advantage".

(Science Forum is a Canadian journal of science and technology that is published every second month. Subscription [$6.00 per year] and inquiries should be directed to University of Toronto Press, Toronto 5, Ontario).

94. Parr, G.J., "Canada Can't Train Too Many New Scientists and Engineers", Science Forum, v. 2, no. 2, April 1969, pp. 6-8.

This article argues that Canada is not producing a surplus of scientists and engineers, contrary to testimony presented before the Senate's special committee on science policy. The author contends that Canadian industry needs more engineering and scientific manpower than it believes, and that an inadequate supply of such personnel is partly responsible for the "poor productivity" of industry. More fundamentally, he opposes the implied proposition that technical manpower needs alone should "direct our educational programs" in science and engineering; education in these areas, he contends, "may offer a fitting education for living in the 20th century whether or not the graduate actually works as a scientist or engineer". "To suggest that there will be too many scientists and engineers is to suggest that there will be too many educated people".

95. Bourns, A.N., "But Do We Really Need All Those Ph.D.s?", Science Forum, v. 2, no. 2, April 1969, pp. 8-9.

"In a brief presented to the Senate special committee on science policy, the National Research Council of Canada has drawn attention to the imbalance developing between the production of the Ph.D.s in science and engineering and the opportunities for their employment. It is estimated that by 1973 approximately 2,000 new Ph.D.s will be graduating from our universities in these fields, while new positions are unlikely to exceed 1,200". The reason for the disparity, according to the author, is that "we continue to relate university research activity in science and engineering almost entirely to graduate student education". He believes that research is one of the fundamental missions of the university; that it need not be coupled with education, and that the "traditional Ph.D. program often does not provide the breadth of training or flexibility necessary in so many industrial jobs". Bourns concludes that "Canada must reassess the objectives of graduate study in engineering and the sciences with the view of developing programs that have greater relevance to current national needs".

96. Jackson, R.W., "Major Programs in R&D: Where The Means Justify The Ends", Science Forum, v. 2, no. 2, April 1969, pp. 10-14.

The role of major R&D programs, such as the U.S. space program, in fostering economic, industrial, manpower, and technological development is discussed in relation to Canada's science policy. The author suggests that the "technology gap" is primarily due to the several large R&D programs undertaken by the U.S. in defense and space, which have required and motivated extensive innovation in technology and in the industrial system itself. The benefits from such efforts, Jackson believes, "will be independent of the particular objective chosen" providing they "present a real challenge to the technology", the challenge involves technology "over a broad front", the program is "large enough that ... the groups formed to attack the special problems will generally be of above-critical or viable size", and the programs are "saleable to the public at large". Simple support of R&D, tax incentives, and other assistance schemes cannot be as effective as a "concerted program" which would stimulate innovation by first creating a definite need for it. As for Canada, Jackson cites some unsuccessful ventures in this direction, and concludes that "[o]nly by instituting large programs and setting objectives will Canada obtain the benefits it hopes will result from spending a large proportion of its national income on science and technology".

Chile

97. "Organic Statute of the National Commission for Scientific and Technological Research", Comision Nacional de Investigacion Cientifica y Tecnologica, Santiago, Chile, 27 January 1969, 4 pp.

A National Commission for Scientific and Technological Research has been established by Chile. The functions of the Commission are to "program plans to guide and stimulate the development of the national scientific and technological potential"; promote and foster technical training through scholarships and subsidies to students, researchers and institutions; promote exchanges among national, foreign, and international institutions; create and expand scientific documentation services; promote the establishment of national research centers; and to represent the Government in international affairs dealing with technical topics. The Statute outlines the organization of the Commission and its management structure, and indicates the financial resources available to the Commission.

(A copy of the document can be obtained from the Comision Nacional de Investigacion Cientifica y Tecnologica, Casilla 297-V, Correo 15, Santiago, Chile).

China

98. Chang, P.H., "China's Scientists in the Cultural Revolution", Bulletin of the Atomic Scientists, v. 25, no. 5, May 1969, pp. 19-20,40.

The treatment of China's scientists during the Cultural Revolution is described and some of the consequences are discussed. The scientific community was immune from attack until 1967, but has since suffered harassment, purges, and arrests. Several examples of the kinds of charges brought against scientists are cited: "spies", "capitalist roaders", "revisionists", "relying too heavily on foreign textbooks". The Chinese Academy of Sciences, the "topmost institution of academic and scientific studies", is under military control, two vice-presidents were arrested, and several members of the Academy associated with China's nuclear program were arrested or charged with various crimes. Other organizations similarly affected are the Commission on Science and Technology, the National Defense Science and Technology Committee, and the State Council's Seventh Ministry of Machine Building (which has jurisdiction for aircraft, missile, and rocket manufacture). These attacks, according to the author, have retarded the development of "modern weaponry, and particularly nuclear weapons" as well as China's missile program. "For what the Cultural Revolution has accomplished in the scientific community, the price is indeed costly".

France

99. "French Research After Eleven Years of Gaullism", Nature, v. 222, no. 5196, 31 May 1969, pp. 841-843.

> This article describes the achievements and failures of the DeGaulle government in science and technology. The accomplishments cited include: (1) an increase in the number of researchers from 25,000 in 1958 to 90,000 today; (2) a growth in the proportion of the GNP invested in research from 1.6 percent in 1963 to 2.3 percent; (3) creation of management machinery essential to French scientific policy; (4) establishment of several research centers (Space, Health and Medical Research, and Oceanography); (5) the launching of several projects such as the Plan Calcul ("a scheme to give France a competitive computery industry"); and (6) the development of a science policy "framework matched by adequate means". On the other hand, opponents of DeGaulle point to these failures: (1) disappointing results of the scientific system created by DeGaulle, especially in the area of fundamental research; (2) "too much subcritical research" carried on "by teams that are too small and too scattered"; and (3) an educational system, which 'does all it can to stifle the qualities of imagination, curiosity, creativity and interest in technology'. The author also cautions that although the DeGaulle government appeared in its last phase to take a more "European rather than a nationalistic approach to scientific policy", "it would be premature to be excessively optimistic" in this regard.

100. "Storm Over the French Space Programme", New Scientist, v. 42, no. 647, 1 May 1969, p. 222.

> "In a series of hard-hitting articles ... the French newspaper Le Monde recently made a swinging attack on the policies adopted and the results obtained by the Centre National d'Etudes Spatiales (CNES), the body charged with the task of preparing and executing the French space programme". "The attack is a telling one, particularly since it is backed up with facts and figures that are not contested by CNES. Two principal charges are made. Firstly, Le Monde claims, the very considerable budget allocations received by CNES have been mishandled. Despite a budget of some two thousand million francs ... the last satellite launching occurred in 1967 and the next will not take place before 1970. CNES was expected to put at least two satellites into orbit a year". "According to Le Monde, too large a proportion of its budget has been devoted to the construction of a costly infrastructure at the expense of scientific experiment". "The second charge made against CNES is that of technological failure", with respect to launcher motors and pressured balloons.

Germany

101. "Will Everything Turn to Gold?", Nature, v. 222, no. 5196, 31 May 1969, pp. 827-828.

The success of West Germany's science and technology, and the reasons for it, are described. Of all Western European countries, Germany has obtained "the most practical benefits from the application of science". The proportion of the GNP devoted to R&D is now 2.1 percent as compared with 1.8 percent in 1965, and the percent is expected to rise to 2.5 percent by 1972 with science expenditures expected to increase by 16 percent each year. Much of the success, in such areas as space and atomic energy, is attributed to the Federal Ministry for Scientific Research and its ability "to make long term plans for four to five years ahead". This, in turn, rests on central planning by the Ministry and the effective cooperative arrangements between the federal and laender governments. The high level of success achieved in the atomic reactor area "seems to lie in the way in which industrial companies have been brought into the development of new projects at a very early stage". University-research support, although growing steadily, has failed "to create a sense of well-being among university scientists" who feel that "they are being neglected" and that the "most effective way of winning adequate support" is to deal directly with the Federal Government rather than the German Research Association which has the responsibility for supporting them.

102. Greenberg, D.S., "Germany: Booming Research Effort Turning to Space and Computers", Science, v. 164, no. 3847, 18 April 1969, pp. 281-283.

German science and technology are undergoing a "growth-rate boom", especially in the fields of space technology and computers. The R&D budget is around the 2.5 percent GNP mark, and space R&D alone has gone from "near zero" in 1961 to $90 million during the current year. The rate of increase of R&D over the past few years has been "at an annual average of 16 percent for a current research total of about $3 billion". Fields of related interest, though of less emphasis, include oceanography, nuclear energy, and electronics. Emphasis has been on commercial applications, at which the Germans have been quite successful. ("West Germans have clinched the first sale of a power reactor to a South American country"). This is partly due to the avoidance of some U.S. mistakes, and partly in deference to a "vulnerable political situation", which of necessity, prompts renunciation of military aspirations. Consequently, German R&D funds can go "directly into scientific research or commercial applications". The German "brain-drain" is still of some concern and is partly the result of a still rigid academic system.

103. Shoemaker, T., "Backbone of German Science", Science News, v. 95, no. 16, 19 April 1969, pp. 386-387.

The Max Planck Society, prominent in guiding German science in pre-Hitler days, is regaining scientific pre-eminence especially in biochemistry and biology. The Society has 52 institutes, 1700 researchers, and a budget of $73 million ($53 million came from West German Government and from individual states). The Society has a great deal of political freedom "unhampered by government control". In addition to biochemistry, the Society is becoming active again in astronomy, after decades of inactivity, and is building "the world's largest fully steerable radio telescope near Bonn". The institutes of Physics and Astrophysics (Munich) and Extraterrestrial Physics are making significant contributions to German space efforts and solar-wind studies, respectively. The Society's scientists, previously barred from teaching are now assuming limited university teaching responsibilities. The change in policy "was mainly to keep in touch with the upcoming generation of scientists".

104. Hammond, B., "Universities Encroaching on the Max Plancks", Science Journal, v. 5, no. 2, February 1969, pp. 6-7.

The Max Planck Society "is now facing readjustments which may demand a total change of its traditional role", as a result of possible reform and expansion of West Germany's universities. The article reviews the role, activities, and financial problems of the Society, and describes the university reforms under consideration. One proposed change in the universities that could encroach on the Society's domain is a greater concentration on selected scientific fields by individual universities. 'For example, Bonn and Cologne will deal with elementary and atomic physics', Heidelberg with 'theoretical and practical stellar astronomy', and Munich with 'space research and work on satellites'. Greater specialization, such as this within the university network "will bring the work of individual [university] research departments much more closely in line with what the Society has regarded as its traditional function of concentrating its forces on specific areas".

Greece

105. "Much to Be Done", Nature, v. 222, no. 5196, 31 May 1969, pp. 832-833.

The current status of Greek science and technology is reviewed and assessed in this article. Greece at present has about "15,000 qualified scientists and engineers -- 0.2 per cent of its population -- and it spends 0.2% of its GNP on research and development". Several "structural defects in the Greek scientific system are cited: (1) an outmoded university structure, which stresses hierarchy to the detriment of junior staff and faculty; (2) low university laboratory productivity; (3) "disorganized and half-hearted" industrial research; (4) poor or non-existent laboratory facilities for science students; and (5) a very high student-staff ratio. Though educational reform was undertaken in 1961, the present government neglected this area for the most part. Consequently, "teachers and researchers have been emigrating from Greece in their thousands ... in search of greater intellectual opportunities", and an "already bad teaching situation" is worsening. In industrial R&D, the Greek government will have to "act as a financier" if Greece is to advance in science and technology, according to a recent OECD report. For technical progress, "the country needs, and at present totally lacks, a policy-making body at the national level concerned with the distribution of research effort".

India

106. Ray, K., "Research In the Third World", New Scientist, v. 42, no. 650, 22 May 1969, pp. 420-421.

An argument is presented for developing nations to increase their R&D spending, on the grounds that "the financial burden of scientific research is light compared with the costs of essential goods". Although the author deals with India, "the principle of my argument applies to other developing countries as well". Data on India's investment in R&D is presented and compared with that of the U.K. and the U.S.A. These show that the cost of supporting an Indian scientist is ten times less than for an American scientist, but 68 times India's per capita national income as compared with 14 times for the U.S.A. Noting that such data are "used to discourage research in India and other developing nations", the author presents other data to show that the cost differential (between India and the U.K. and U.S.A.) is much greater for essential commodities such as food, industrial materials, and electricity. "It is thus less of a burden for India to maintain research than to buy essential commodies -- domestic or industrial. It would, therefore, be worthwhile expanding R&D in India and other developing countries".

107. "Nuclear Power Station in India", Science, v. 164, no. 3877, 18 April 1969, p. 280.

"India's first commercial nuclear power station, located about 60 miles north of Bombay near Tarapur, is reported to be generating electrical power to the western states of Gujarat and Maharashtra. The power plant, estimated to cost about $114 million, is being built from money borrowed in part from the U.S. government. The Agency for International Development is loaning about $75 million, and the Indian government is investing about $40 million in the project. The U.S. Atomic Energy Commission has agreed to supply about $100 million in enriched uranium to the power station over a 30-year period. The plant, which has a total capacity of nearly 400,000 kilowatts, is said to be one of the first commercial nuclear power stations in Asia".

Ireland

108. "Much Room for Growth", Nature, v. 222, no. 5196, 31 May 1969, p. 848.

Recent developments in Ireland's science policy are briefly summarized. Science expenditures have increased by about 70 percent between 1963-76, with a growth rate of 9 percent annually; at present, R&D expenditures are roughly 0.6 percent of Ireland's GNP. A National Science Council was established in January 1969 which, among other things, will encourage the development of industrial projects through R&D grants that "provide for up to 50 per cent of the cost of research programmes over a period of 3 years so long as the work concerned is carried out in Ireland". In academic research, the Council "would like to see ... a scheme whereby it could make grants for the support of research projects" that would foster links with industry. Certain research institutes maintained by the Irish Government are being reorganized and redirected: the Geological Survey Office will intensify its prospecting efforts toward contributing more to Ireland's economic development, and the National Standards Laboratory will have closer links with industry.

Italy

109. "Notes on Italian Science", International Science Notes, no. 22, May 1969, pp. 8-14.

This article consists of selected topics taken from a recent longer report on Italian science. It deals with R&D Expenditures, the National Research Council (CNR), Formulation of Science Policy, R&D within the National Government, and International Aspects of Italian Science. R&D expenditures have been rising rapidly: 72 percent between 1965-68 in the government sector and 43 percent in the public sector. "Even so, there seems little prospect that Italy will make up the gap during the next decade between her research effort and that of France and Germany". As for CNR, its aims, functions and activities are described in some detail. Italy does not have "a clearly formulated science policy", but its per capita GNP has risen to the level where "there begins to be some room for formulating" such a policy. The National Government "supports nearly all the fundamental research in Italy, much of it at the more than a thousand research institutes, centers, and laboratories affiliated or associated with the universities"; research efforts in physics and biomedicine are described. Italy's disappointing involvements in international science are cited and discussed.

(International Science Notes is prepared by the Office of General Scientific Affairs, U.S. Department of State, Washington, D.C. 20520).

110. "Disorders Open Up the Sores", Nature, v. 222, no. 5196, 31 May 1969, pp. 883-834.

The status, problems, and prospects for science in Italy are examined. Public expenditure for research in 1968 amounted to $333 million and a further $222 million was spent by the private sector; it is expected that public expenditures will increase to $2,120 million during the next five years, amounting to about 0.7 percent of the national income. Student protests have had a disruptive effect on universities as well as research laboratories and projects; for example, the "Berkeley aid programme to help develop Italy's first regular PhD course at Naples", under the International Studium of Molecular Biology, may not "survive in its original form". However, progress is being made on several fronts: a new space research station is to be built, which will cooperate closely with ESRO and will concentrate on basic aspects of physics and chemistry; Italy's first oceanography station is planned for the study of the Interaction of the sea and the atmosphere; the Italian Government has also "revived the idea of a European University, a concept approved by all the other countries in the European Economic Community except France", which will be a "sort of international postgraduate school".

Japan

111. "Japanese Accelerator Plan Collapses", Scientific Research, v. 4, no. 11, 26 May 1969, pp. 21,23.

"Japan's plan to build a new elementary-particle laboratory with a 40-GeV proton synchrotron is on the verge of collapse because of a dispute between scientists and the government over the lab's size and cost. On one side of the hassle is the Nuclear Science Committee of the Japanese Science Council, which has been mapping plans for an ambitious accelerator laboratory that would cost $83.3 million. On the other side is the Ministry of Education, which has adopted its advisory committee's proposal for a much smaller $20.8-million lab with a proton synchrotron of 5 to 10 GeV. Sources close to the advisory committee say that its recommendation was influenced by mounting pressure from scientists in other fields who feared a shortage of funds for their own work if the more expensive lab were built". "The current confusion is the latest in a series of conflicts that have stalled plans for Japan's elementary-particle lab for more than two years".

112. "Japan's R&D Appropriations for Fiscal Year 1969", International Science Notes, no. 22, May 1969, pp. 2-3.

The Janapese R&D appropriations for activities in government research laboratories and in universities are presented. The R&D budget is $607 million, which is 3.25 percent of Japan's total budget of $18.7 million. The R&D budget remains approximately equal to those of the two preceding years, although the actual increase in two years is from $455 to $607 million, "which, despite a little inflation, is substantial". "There is no significant change in ... the pattern of government's 30% and industry's 70% share of the R&D expenditure. The total for 1969 has reached an estimated $2 billion". There are a few new features in the government's R&D program for the next fiscal year. "Briefly, the Japanese Government has begun to show enthusiasm for the so-called 'big science'. The government has now identified the three areas of atomic energy, space and oceanology as 'national projects' requiring concentration of financial and manpower resources for their development". A tabulation of the 1969 science budget by category is given, as well as the appropriations for individual activities within the categories.

(International Science Notes is prepared by the Office of General Scientific Affairs, U.S. Department of State, Washington, D.C. 20520).

113. "Japan's Budget for Space Activities", International Science Notes, no. 22, May 1969, pp. 6-7.

Japan's total space budget for fiscal 1969-70 has been fixed at about $25.6 million ($20.4 million was allotted in the previous fiscal year), as against the original request for $39.6 million. "The space appropriations for fiscal 1969, does represent an increase of 25.6 percent over the current fiscal year. The largest share of this goes to [the Space and Technology Agency] STA which receives $14.6 million. This figure is 60% more than last year's space budget for that agency, but it represents only one-half of the $29.7 million which the Space Activities Commission believed necessary if STA is to maintain its tight schedule of developing the Q and N rockets and application satellites". In addition, Tokyo University's Institute of Space and Aeronautical Science was awarded $8.4 million of a requested $10.5 million and the Radio Research Laboratory of the Posts and Telecommunications Ministry was allocated $1.8 million. The remainder of the article lists the goals of the space program, and describes in more detail some of the program's activities.

(International Science Notes is prepared by the Office of General Scientific Affairs, U.S. Department of State, Washington, D.C. 20520).

114. "Japan's Budget for Marine Science and Technology", International Science Notes, no. 22, May 1969, p. 4.

The Japanese marine science budget for the new fiscal year, and new R&D projects budgeted for the first time, are presented. "Of a total of $8.8 million newly earmarked for general marine science activities, $6.7 million is for implementing 'top priority' programs including establishment of basic policy for promoting ocean development technology, basic investigations for ocean development, and comprehensive development of the Continental Shelf". Although the traditional interest in promoting fisheries remains as active as ever, new R&D projects budgeted for the first time are "(1) a 3-year plan to construct an underwater habitat for a group of four persons to live for a month at a depth of 100 meters, and (2) an 8-year plan to make a 100,000-ton pilot desalting plant by the multi-stage flash evaporation process". A table of the Marine Science Budget is presented which gives fiscal allocations for 1968 and 1969 by government sponsoring agency.

(International Science Notes is prepared by the Office of General Scientific Affairs, U.S. Department of State, Washington, D.C. 20520).

Norway

115. "Universities the Weak Link", Nature, v. 222, no. 5196, 31 May 1969, pp. 847-848.

The organization of science in Norway, its expenditures for research, and the structural problems of Norway's universities are reviewed. "The growth of expenditure in Norway on research and development has been unbroken since the early sixties, and the cost of research and development now exceeds 1.1 percent of the gross national product. The Norwegian Government provides close on two-thirds of what there is to spend, and the work is shared almost equally by the universities, industry, and the public and private laboratories which are engaged on research. The management of the publicly financed research is organized through three research councils, each of which is attached to a different ministry in a manner which seems well designed to provide each of them with a sense of competitiveness, a substantial degree of autonomy and a certain clarity of purpose".

Poland

116. "Emphasis on Industrialization", Nature, v. 222, no. 5196, 31 May 1969, pp. 829-830.

The organization of R&D in Poland, expenditures for research, and plans for the Polish national science program are reviewed. Total expenditures for R&D "amounted to 1.3 per cent of the national income in 1967, and the average annual rate of growth ... in the period 1961 to 1965 was about 10 per cent". Science planning "is directed by the Committee on Science and Technology in cooperation with the Academy of Sciences, the National Economic Planning Commission and the Ministry of Finance on the basis of the national economic policy". Research is carried out by three groups of institutions: institutes of the Academy, which have a staff of more than 2,000; universities, technical schools, and medical academies, with a staff of about 22,000; and institutes responsible to the "economic ministries" which employ about 10,000 scientists and engineers. Money comes from "the state budget and a special ... fund raised as a levy on industrial production". Poland's national program "has consistently emphasized ... the need to coordinate research with industrial production"; mechanisms for achieving this are described. Polish activities in fundamental and applied research are briefly reviewed, and its international cooperative programs are cited.

Sweden

117. "Environmentally Conscious Sweden", Nature, v. 222, no. 5196, 31 May 1969, pp. 830-832.

Sweden's research apparatus, its expenditures for R&D, and especially its efforts in 'environmental conservancy', are reviewed and discussed. R&D expenditures constituted about 1.5 percent of Sweden's GNP in 1964; the total allocation for higher education and research in 1969-70 is Kr. 8,110 million, an increase of 14.4 percent over the previous year. Organizationally, the Science Advisory Council coordinates the work of eight councils, each responsible for a given area of research (e.g., natural sciences, medicine, traffic safety), and advises on science policy generally. Research itself is carried out through a system of research institutes and universities, the latter performing the bulk of fundamental research. As for environmental conservancy, Sweden is well ahead of most nations in its concern and activitity in air and water pollution abatement; "it leads the world with its countrywide ban on DDT ... and with its careful evaluation of the insecticide problem". Other efforts in this area are described in the article.

United Kingdom

118. "New Directions Ahead?", Nature, v. 222, no. 5196, 31 May 1969, pp. 845-846.

Policy issues in the management of British research and the activities and plans of the major supporting agencies are surveyed and discussed. In fiscal terms, science "seems to have escaped from the full rigours of the economic squeeze"; data showing the continued upward trend in expenditures are presented. However, several issues concerning the administration of science are matters of much concern: the relationship of the different agencies that support; collaboration with other European countries; relative emphasis on industrial-oriented R&D; and "the coordination of the interests of academic science and of technology". Policy directions of the Science Research Council, a major supporter of university research, are discussed, as well as the Council's role in Britain's decision not to contribute to CERN's 300 GeV proton accelerator. The "remarkable" growth of the Natural Environment Research Council, its potential problems, and policy issues are described. Finally, the increasingly important role of the Ministry of Technology, in both domestic and international science, is discussed with respect to industrial research, the use of government laboratories, and cooperative space research with European countries.

119. "British Defence Research Examined", Nature, v. 222, no. 5193, 10 May 1969, pp. 505-506.

The Select Committee on Science and Technology, has recently completed its study of defense R&D in Britain; this article summarizes and comments on the study. The report is said to provide "the best account so far of the workings of the machinery of defence research"; its theme appears to be that "there should be closer links between ... the defence research establishments, and industry". Although defense research is a declining proportion of Britain's total R&D expenditures, it is still about 25 percent of the total, with more than half going to aircraft and missile development. The report urges more "collaboration or at least coordination" with Western European and North American countries in the area of defense R&D. "The most striking suggestion in the report is that some consideration should be given to the joint direction of the government establishments by the Ministries of Defence or Technology ... and industry". The report is criticized for neglecting "criteria which might be used to strike a balance between defence and civil research and development" and for failing to consider "circumstances in which it would be prudent to spend more money" in areas other than defense. However, it is suggested that the central question is "whether it is possible to turn defence establishments to work of potential value to industry, and whether that course is more profitable than simple abandonment of them".

120. "No Change at Sea", Nature, v. 222, no. 5191, 26 April 1969, pp. 310-311.

U.K.'s "long awaited White Paper on marine science and technology" (Report on Marine Science and Technology, HMSO 5s 6d) is reviewed and discussed. Overall, the "recommendations in the White Paper are in effect an instruction to carry on as before"; in comparison with activities and plans of the U.S. and France, "the report's recommendations look pedestrian". Government expenditures on marine science and technology were over £13 million in 1967-68, with the Ministry of Defense spending more than half the total (primarily on hydrographic surveys). Data showing expenditures by area (e.g., marine biology, fisheries, transport) are presented, as well as the government departments responsible for each area. The White Paper expresses satisfaction with basic research in the area, calls for more R&D in fisheries, and expanded use of the seabed for sand and gravel resources. The "White Paper does not seem calculated to fire anyone with enthusiasm. The suggestions for coordinating oceanography research are not calculated to exorcize the fear that a deal of overlapping is going on".

121. Rose, H. and S. Rose, "Knowledge and Power", New Scientist, v. 42, no. 645, 17 April 1969, pp. 108-109.

The origin and purpose of the British Society for Social Responsibility in Science is discussed by two of its founder members. The Society, which was an outgrowth of scientific and social concern expressed in the recent chemical and biological warfare controversy, was organized to enable scientists and society to better understand their interrelationships in determining science policy. One task of the new Society is to formulate a code outlining for scientists their "ethical responsibilities" in the community. The Society will also inform the public of the "social and political implications" of current research so that society will be better able to "make a democratic decision as to whether it requires or would welcome" certain research developments. Illustrative of the topics of interest to the Society are nuclear weaponry development, genetical engineering, organ transplants, and space exploration.

U.S.S.R.

122. Davies, R.W. and Amann, R., "Science Policy in the U.S.S.R.", Scientific American, v. 220, no. 6, June 1969, pp. 19-29.

The size, policy issues, and some problems of R&D in the U.S.S.R. are presented and discussed. This report is based on an extensive study of Soviet science policy conducted by an international team for the OECD. In terms of manpower, "the U.S.S.R. is devoting at least as much effort as the U.S. to R. and D.", but the "productivity per man is distinctly lower in the U.S.S.R." Like the U.S., Soviet "outlays on R. and D. have slowed markedly in the past few years". The two major issues discussed are (1) the proportion of the national resources that should be devoted to R&D, and (2) the "relative allocations to fundamental research and to development". As for the first, "a vigorous contest over the level of research expenditures seems to be underway at the top levels of the Soviet Government". As for research versus development, there is general agreement that too little is spent for the latter, but there is disagreement as to whether the needed funds should come from the "research budget" or from the "general national capital budget". The organization of Soviet research is described as it relates to these issues, the factors that impede the practical application of research to industry are discussed, and the effectiveness of some of the efforts "to bring research, development and production more closely together" are assessed. Finally, some new Soviet schemes to increase innovation and "to tailor products more directly to the requirements of industry" are presented.

123. Zaleski, E., "Soviet R&D: Finance -- and Allocation", Science & Technology, no. 89, May 1969, pp. 8-15.

The planning of Soviet R&D, its financing, and performance criteria are described in this abridgement of the first section of the OECD report, "Science Policy in the USSR". The difficulties in fitting R&D into the National Economic Plan have "prevented the elaboration of a comprehensive" R&D plan; however, efforts are underway to do so, one of which is described. The stages and timing in the development of the national R&D plan, and the agencies responsible for each, are reviewed, and some of the criteria for assessing the contribution of research are described. The Union and Republic research budgets are presented for the period 1958-1965, as well as the 1964-1966 budgets for the USSR Ministries and the Academy of Sciences. The return from expenditures are now being "graded on a double-basis: (1) quality of the work; and (2) generated savings". This new method of evaluation is part of the reforms initiated in 1965 to create greater autonomy, competition, and effectiveness of R&D institutes.